TECHNOLOGY DEPT.

The Chemical Age

VOL LXVII 22 NOVEMBER 1952 No. 1741

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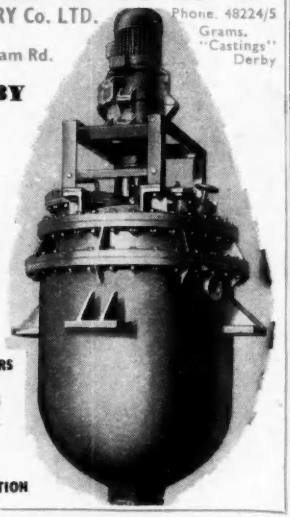

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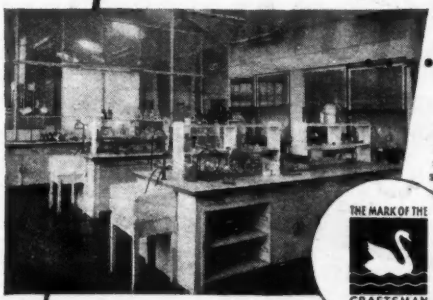

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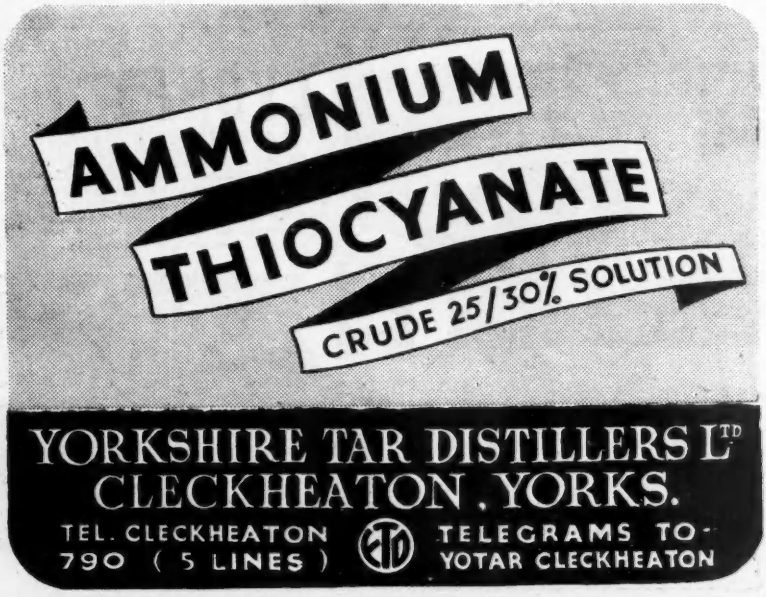

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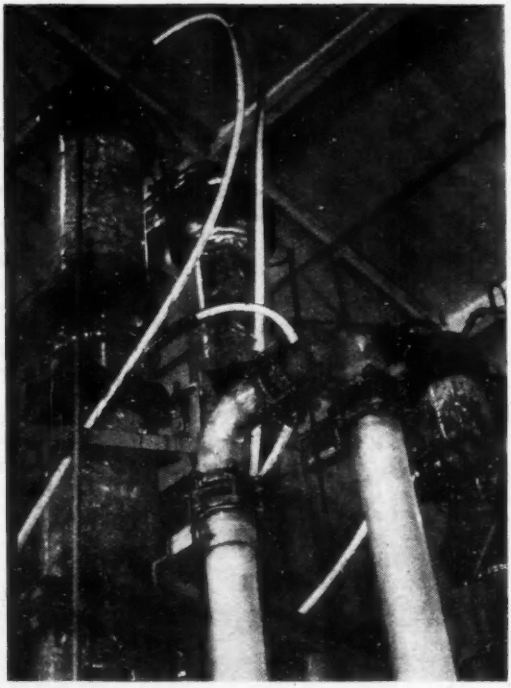

Section of Hydrochloric Acid Absorption Towers
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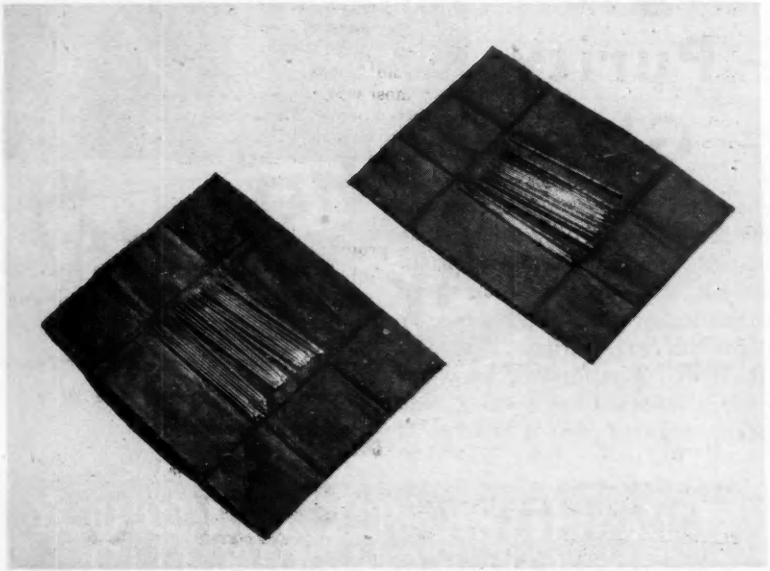

Right: Nickel-plated steel needles wrapped in 'purple' paper, showing heavy corrosion after a period of storage.
Left: Needles wrapped in similar paper containing 7% Sodium Benzoate—rust free.

The Benzoates

Monsanto has established a solid reputation for the manufacture of those well-known and accepted preservatives for the pharmaceutical and other industries—Sodium Benzoate BP and Benzoic Acid BP. As a result of wartime discovery, Sodium Benzoate BP has developed new and more varied applications in many other spheres. As an impregnant for paper and other wrappings (see illustration), it is giving protection against corrosion to valuable exports such as needles, razor blades, engine parts, machine tools, etc. In solution, it prevents corrosion in heat exchangers, cooling systems and other types of equipment. It is also being used to improve the shelf life of water-based products such as water paint, by prevention of rusting.

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SANTOBRITE* SANTOPHEN*-20

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BENZOIC ACID BP, P.C.M.C.

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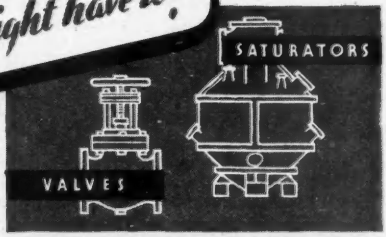

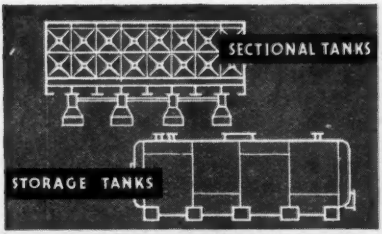

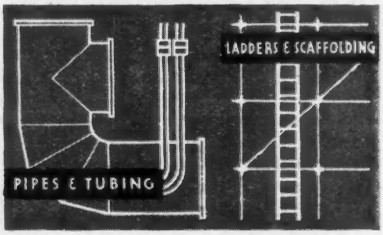

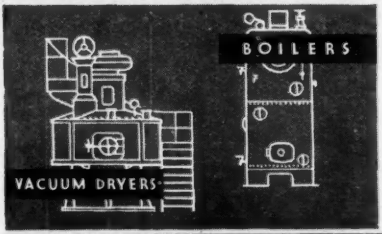

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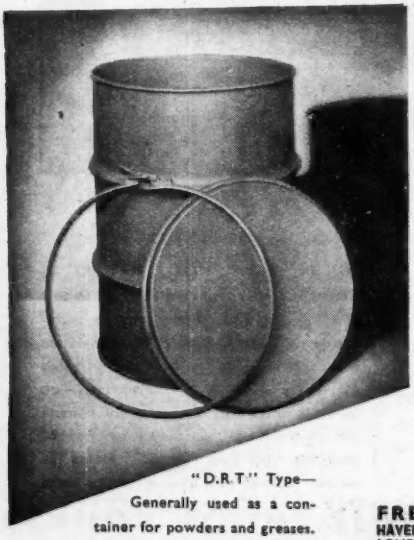

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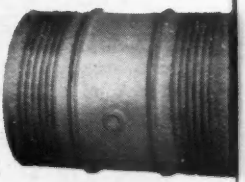

"D" Type. Body seam welded, ends double seamed to body.

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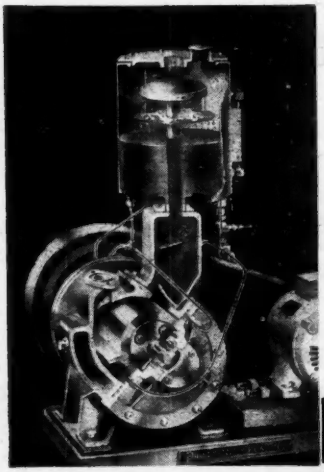

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Volume LXVII 22 November 1952 Number 1741

Progress in Advertising

PERHAPS for once in a way we may be permitted to depart from a primarily scientific or technical topic. In any case we must plead 'Not Guilty' to charges of wilful aberration, for we have been irresistably tempted out of our routine and habits by a most delightful book, Mr. E. S. Turner's 'The Shocking History of Advertising' (Michael Joseph, 15s. net). However, we are probably not wandering so far away from chemicals and chemistry in considering one of the means by which so many chemist-devised and chemist-controlled products have been sold, especially because one of the outstanding points made by Mr. Turner's history is the great improvement that has been effected in modern advertising standards. His history is, indeed, shocking, or at any rate many of the examples he produces are shocking; and the very fact that we are shocked by them—although, perhaps, more often amusingly than appallingly shocked—is in itself a proof of our better standards.

Mr. Turner dispels any illusions we may have as to the relative modernity of advertising. He quotes an advertisement of 1660 from one of England's first news-sheets, *Mercurius Politicus*: 'Most excellent and approved dentifrice to scour and cleanse the teeth, making them white as ivory. . . . It fastens the teeth, sweetens the breath, and preserves the gums and mouth from cankers and imposthumes. . . .' Even the great Dr. Johnson in 1759 was writing: 'Advertisements are now so numerous that they are very negligently perused, and it has therefore become necessary to gain attention by magnificence of promises, and by eloquence sometimes sublime and sometimes pathetic,' and later, 'The trade of advertising is now so near to perfection that it is not easy to propose any improvement.' By the 18th century the producers of medicines and pills and oilments were tumbling over themselves in the columns of newspapers, weeklies, and coffee-house hand-bills. And the copywriters of those days were certainly not slow to realise that the word 'Chymical'—always worth a capital letter—had excellent virtue. Today, in some contrast, the copywriter aiming his verbal legerdemain at the lay public would probably regard 'chemical' as a rather risky adjective and almost certainly a dangerous noun!

By 1850 it was being said that anyone with £10,000 to spend on pushing a patent medicine could not fail to make a large fortune. Mr. Turner's book reminds us

of Thomas Holloway, greatest of the early Victorian pill and ointment manufacturers, who was spending £5,000 a year on advertising in 1842, over £30,000 by 1855, and £50,000 in the 'seventies. If now we seem to be wandering far from the boundaries of true science, we are jerked back by the reminder that Holloway created and endowed the Holloway College, now the Royal Holloway College, University of London. The second half of the 19th century, indeed, reveals many associations between scientific development and advertising.

A young man of 24 named Barratt who entered the Pears soap business in 1865 had little respect, however, for the technical side of soap manufacture. 'Any fool can make soap. It takes a clever man to sell it.' He quickly raised expenditure on advertising from £80 a year to £100,000. He claimed that he could sell soap 30 per cent cheaper only because he mass-advertised it. Dickens, incidentally, refused an offer of £1,000 from Holloway to give a 'puff' for the 'Professor's' pills, but Lord Byron does not seem to have been so reluctant to assist Rowland in publicising his Macassar Oil or in helping Warren's Shoe Blacking. Scientists can look back upon the history of advertising and take some comfort from knowing that their comparative anonymity has spared them much temptation.

With steady changes in technique the pattern of 20th century advertising followed the pattern set in the later Victorian age. To most of us now middle-aged the more modern period is history we have ourselves witnessed. How many of us, however, took particular note of the 1951 revolution when bill-posters one day went forth and pasted strips of paper over 'offending words' in posters on hoardings and in the Tube subways? It was the date-line for the new advertising Code of Ethics, forbidding claims to cure any ailment or symptom of ill-health, the use of words such as clinic, college, or laboratory unless such establishments exist, the use of 'Doctor' or 'Dr.' in product names unless on the market before 1944, the use of phrases like 'acts like a charm', and banning the mention of certain diseases. But it has been said that the most spectacular post-war advertising has not been in the patent medicine but in the washing field—in the battle between soap powders and detergents. As in Barratt's days, dirt removal offers as golden a market as the relief of ill-health.

Mr. Turner's delightful book does not deal with trade or technical advertising, a subject for some other historian later. It should be no less rewarding though much less 'shocking'. In this more specialised branch a far higher standard of fact-presentation has long been upheld, and this standard, at one time somewhat dully presented, has not been diminished with the more recent and increasing introduction of commercial artists' work. If attractive devices to catch the reader's eye have increased, the eye, when caught, is not affronted with illiberal claims or exaggerated statements.

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Notes & Comments

Interchange of Scientists

SHORTLY before the Presidential Election this month, it was reported in the U.S.A. that efforts would be made in the next session of Congress to ease the stringency of regulations now controlling visits to that country by foreign scientists. The McCarran Act, passed earlier this year despite President Truman's opposition, is said to have increased the difficulties visiting scientists experience in obtaining visas. It has been estimated that about 200 distinguished European scientists have experienced visa trouble after being invited by American organisations to make a trip across the Atlantic; in a considerable number of cases, according to the *Bulletin of Atomic Scientists*, visa trouble takes the form of delays which last until after the date on which the visit would be practicable. The McCarran Act in present form requires U.S. consuls to make exhaustive investigations into the past lives of persons wishing to visit the United States. It is a fact that no additional personnel have been provided for making these inquiries, and this, together with the lack of training for such tasks of some of those who must carry them out, leads to unwieldy delays. It is also said that consulates are unduly cautious for they are less likely to incur extremist criticism by refusing visas than granting them.

Regrettable Policy

THESE are not opinions from outside the U.S.A. They are the views of scientists and scientific organisations in America. Most Europeans will probably feel that America's restrictive policy has become over-cautious, over-sensitive to fears for her national security. It is surely regrettable that the interchange of scientific views and ideas should be impeded in the West as well as between East and West. We have moved a long way since the time when Sir Humphrey Davy was able to visit France during the state of war between Napoleon and Britain and exchange views with French scientists. Then, indeed, science had an international or supra-national status, but, of course, its importance in terms of security was much less appreciated then. The world seems to be moving slowly to the other extreme.

Diet & Antibiotics

THE potentialities of antibiotics continue to expand. The day has already passed when their single contribution was in the field of medicine, for large quantities are now regularly used by American farmers as growth-stimulating supplements in poultry and pig diet. It is now suggested that antibiotics may play an even greater part in human nutrition, particularly in those areas of the world where the basic diet is wholly or almost wholly vegetarian, as in India and the Far East generally. Recent rat experiments at the National Institute of Arthritis and Metabolic Diseases at Betheseda (U.S.A.) have indicated that traces of antibiotics increase the nutritional value of vegetable protein. The rice bowl plus traces of antibiotics may be able to transform human nourishment in the East. With rats additions of penicillin or aureomycin to a rice diet resulted in nutritional improvement almost as marked as that obtained when vitamins, minerals, and additional amino-acids were used to fortify the rice. This is not to be confused with the growth-stimulating effects obtained with pigs and poultry, which on the whole have been secured whether or not the protein in the basic diet has been of low or high quality; though, obviously enough, since these effects have yet to be explained, the fundamental nutritional cause may be common to both effects. Indeed, some British scientists have already pointed out that the exceptional success of antibiotics in U.S. pig and poultry feeding may be due to the fact that cereals are more predominantly used there for stock feeding than in Europe.

Unlimited Possibilities

DR. OLAF MICKELSEN, who recently reported this new research work to the American Dietetic Association believes that antibiotics in human nutrition have unlimited possibi-

lities and implications. Large numbers of people in the world have no option but to live upon an all-vegetable diet although it has long been known that some animal protein—from eggs, milk, fish, meat, or poultry—is essential for good health. But the relative costs of animal protein steadily rise and the world's supply and demand balance seems to make it less and less likely that animal protein foods can become more widely distributed. Are traces of antibiotic substances going to fill the gap? At the lowest estimate, it is an intriguing and important speculation.

Sulphuric Acid Returns

Lower Production & Consumption

CONSUMPTION of sulphuric acid and oleum in the United Kingdom in the three months from 1 July to 30 September, 1952, at 325,726 tons, was again lower than in the first two quarters of the year.

Production of chamber and contact sulphuric acid in the third quarter was 316,515 tons compared with 34,652 tons in the period 1 April to 30 June, while stocks at the end of September totalled 74,017 tons, a reduction of 4,694 tons.

These figures and the following tables are taken from the Summary of Monthly Returns for the United Kingdom issued by the National Sulphuric Acid Association Ltd.

PRODUCTION OF SULPHURIC ACID AND OLEUM
(*Tons of* 100 *per cent* H_2SO_4)

Data referring only to Acid Makers' Returns	Chamber only	Contact only	Chamber and Contact
Stock, 1 July, 1952 ..	29,157	44,860	74,017
Production	120,500	196,015	316,515
Receipts	16,085	7,926	24,011
Oleum Feed	—	591	591
Adjustments	−6	+33	+27
Use	65,244	84,035	149,279
Despatches	75,073	121,486	196,559
Stock, 30 September, 1952	25,419	43,904	69,323
Total capacity represented	190,710	315,150	505,860
Percentage production	63.2%	62.2%	62.6%

RAW MATERIALS
(*Tons*)

Data referring only to Acid Makers' Returns	Pyrites	Spent Oxide	Sulphur & H_2S	Zinc Concentrates	Anhydrite
Stock, 1 July, 1952 ..	166,948	244,482	89,436	55,285	870
Receipts ..	21,671	57,411	39,263	56,634	48,883
Adjustments	−224	+206	−4	+53	—
Use	48,598	52,032	41,042	40,819	49,253
Despatches*	247	3,398	263	—	—
Stock, 30 Sept., 1952 ..	139,550	246,669	87,390	71,153	500

*Including uses for purposes other than sulphuric acid manufacture.

Note.—The above figures include production at Government plants where those plants are producing acid for trade purposes.

CONSUMPTION—UNITED KINGDOM
(1 *July*-30 *September*)

Trade Uses	Tons 100% H_2SO_4
Accumulators	2,220
Agricultural purposes	4,704
Bichromate and chromic acid	2,996
Bromine	2,869
Clays (Fuller's earth, etc.)	1,650
Copper pickling	626
Dealers	2,477
Drugs and fine chemicals	4,178
Dyestuffs and intermediates	5,978
Explosives	6,763
Export	389
Glue, gelatine and size	83
Hydrochloric acid	11,160
Hydrofluoric acid	2,351
Iron pickling (incl. tin plate)	23,106
Leather	626
Lithopone	1,394
Metal extraction	384
Oil refining and petroleum products	17,441
Oils (vegetable)	2,565
Paper, etc.	811
Phosphates (industrial)	156
Plastics, not otherwise classified	3,447
Rayon and transparent paper	24,322
Sewage	2,347
Soap and glycerine	5,845
Sugar refining	155
Sulphate of ammonia	64,537
Sulphates of copper, nickel, etc.	6,560
Sulphate of magnesium	878
Superphosphates	74,552
Tar and benzole	4,208
Textile uses	4,907
Titanium oxide	15,572
Unclassified	23,469
Total	325,726

Detection of Sulphur Dioxide Fumes

A new chemical device—only the size of a cigarette—which detects the presence of sulphur dioxide in the air was described in a recent report to the American Chemical Society by Gordon D. Patterson, Jr., of E. I. du Pont de Nemours and Company, Inc., Buffalo, and Professor Melvin G. Mellon, of Purdue University, Lafayette, Indiana. The detector, through which air is passed, is a small glass tube, containing gels which change colour according to the concentration of the gas. Most promising tests were with vanadate-silica which changes from yellow to green or blue in the presence of sulphur dioxide, and the other a periodate-silica gel which changes from white to pink or red-brown.

East German Chemical Industry

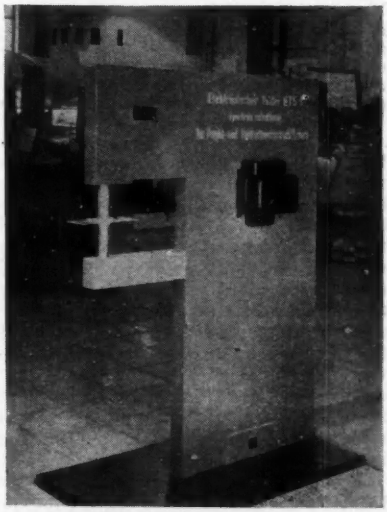
A Survey of the Leipzig Fair

(BY JOHN CARDEW)

AN interesting aspect of the Leipzig Fair held in Eastern Germany in September was the light that it shed on the high priority the East German authorities have accorded to the chemical industry in development plans. The exhibition of chemicals and chemical equipment was the largest Eastern Germany has so far displayed in what has become the East's most important shop window, and a two-fold emphasis was apparent— the key rôle allotted to the chemistry industry in long-range plans to expand the Eastern zone's heavy industry and the part that chemical and chemical engineering products are expected to play in the country's export trade.

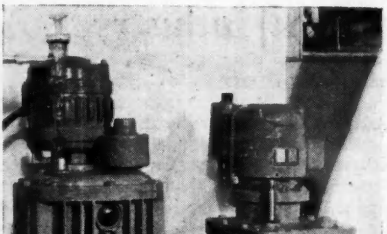
Under the five-year plan (1951-55), now governing the economy of Eastern Germany, production in the chemistry industry is scheduled to double the 1950 output. During these five years investments in the industry are to total over £140,000,000 and one aim of the programme is to make the country self-sufficient in all the basic chemicals needed by industry. Beginning next year, there is to be special concentration on expanding the output of chemical works producing basic chemicals, fuel, plastic materials, soda, and industrial acids. The eastern zone's poverty in raw materials has, since 1945, made enormous demands on the chemical industry to find substitutes and devise new uses for waste products of industry, and under this impetus there has inevitably been a considerable expansion of chemical production. In 1951, according to a recent issue of a Berlin economic journal, more than 600 research and development projects were successfully concluded in Eastern Germany—all of them calling on the resources of the chemical industry.

The location of Eastern Germany's biggest chemical works is determined by deposits of brown coal, the basic raw material which is consumed in great quantities by all the plants. Accordingly, the industry is concentrated in central Germany, especially at Merseburg, Bohlen, Espenhain, Rositz, Bitterfeld, and Lauchhammer. Apart from lignite, the only other raw materials found in abundance in Eastern Germany are potash, rock salt, and gypsum. Traditionally based on these minerals and some others, the German chemical industry has always been a big exporter of finished products, and it is characteristic of the present economy in the Eastern zone that potash and rock salts are the only raw materials being exported.



A new electrically timed welding machine for seam and spot welding shown at Leipzig

One of the most interesting successes claimed by the East Germans is the production of sulphuric acid from a magnesium sulphate base. Nothing has so far come out about the process, but a plant is known to be working at Leuna, former I.G. Farben dye centre, where a big chemical works named after the East German deputy



Two new Simplex pumps with capacities of 5 and 10 cu. m. per hour. Maximum vacuum is 3 × 10-5 torr. The manufacturers are also making 2-stage, high-vacuum oil airpumps as single, twin and quadruple pumps for the electric bulb industry

Premier, Walter Ulbricht, produces nitrogen salts from the air and makes fuels from lignite. Magnesium sulphate—kieserite—is abundant in the vast potash deposits of the Harz Mountains region and its use for sulphuric acid has been officially hailed as the beginning of a 'new phase' in the East German chemical industry. The Government is already assessing its importance to the Eastern zone's export trade. The five-year plan target of a sulphuric acid production reaching 450,000 tons in 1955, or about double the 1950 output, is said to have been set before the Leuna plant began working.

A model prominently displayed at the Leipzig Fair dealt with a new de-phenolising process developed by Dr. Alfred Dierichs, of Pirna, near Dresden. Dr. Dierichs is attached to the Mining Academy at Freyberg and has recently been explaining his discovery to specially convened conferences of mining and metallurgical engineers. As in the former three-stage process, butyl acetate is the solvent in Dr. Dierichs' seven-stage continuous process on the counter-current system. The extraction of phenol is claimed to be more thorough, leaving a final percentage of phenol of 50 mg. per litre, maximum, compared with 120-150 previously.

More recently experimental results are reported to have shown that the final concentration can be further reduced to 20 mg. per litre. A plant is working in Eastern Germany at Lauchhammer where metallurgical coke is being produced from brown coal. Experiments are also being conducted into the recovery of phenol from generator gases, notably in steel works, and from sewage water. The East Germans are exporting de-phenolising plants and are at present working on orders from Poland and Hungary, in the latter case also for use in a plant to make coke from brown coal.

In plastics the East Germans have recorded some new developments and showed them at the Leipzig Fair for the first time. A PVC plastic with considerable elasticity has been successfully used for mudguards on a light car, and plans are said to be in hand to make entire bodies for passenger cars from plastic. Plastic car fittings, including headlights, have been made for some time. Two new East German plastics are 'Silikon' and 'Igurit' and both appear to have extensive industrial applications. The former was developed in Dresden and is being made commercially but is not yet being exported. It is used as an insulating material in the manufacture of electric motors and dynamos and makes possible, in addition to smaller motors, the use of aluminium windings. Wire of copper or aluminium is treated by passing it through a bath of 'Silikon' and drying at 100—120°C. 'Igurit S' and 'Igurit AS' are at present being widely used in Eastern Germany for absorbers in the manufacture of acids, extracting apparatus, heat exchangers, filling bodies, ventilators, de-aerators, agitators, pumps, and rectifying columns. 'Igurit S' is resistant to HCl, solutions of inorganic materials and sulphuric acid at 60°C., and 'Igurit AS' is in addition resistant to diluted and concentrated cold or boiling alkalis, concentrated sulphuric up to 70°C. and temperatures up to 300°C. The plastic is made at a factory in Bitterfeld.

'Piacryl-D,' for dentures and for use as a filler under the skin in plastic surgery, has been developed in Eastern Germany by polymerising methyl methacrylate. It can be worked without plasticisers or hardeners and lime, coal, and air are stated to be the prime substances used in the making. A

phenol product 'Laktum,' is of special importance in the East German chemical industry, since it is used to make 'Perlon' synthetic fibre as well as plastic bristles. 'Laktum' is the starting material and it is turned into polyhexanol. Other East European countries are known to be interested in 'Laktum' and a producing plant for Poland is at present being made in Eastern Germany.

Laminated moulding materials for plastics have been considerably improved in Eastern Germany in recent years. 'Didi' (dicyandiamide) moulding powder is expected to be available in light colours in the near future, according to an East Berlin journal.

A phenolic resin with the same specific gravity as ivory is being used for billiard balls, buttons, and necklaces in Eastern Germany. A solution of synthetic resin, from phenol, forms a binding material for sandpaper. A plastic coating varnish for pianos is similar to nitrocellulose and is also being used for playing cards, chess men and 'Perlon'-strung rackets.

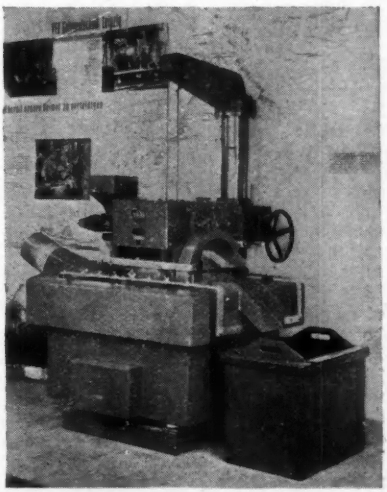
Several new East German non-plastic materials are also interesting. An anhydrite flooring material, 'Leunit,' is a composition of great hardness (180 kg. per square centimetre) with a bending tensile strength of 60 kg. per square centimetre. It replaces 'Xylolyte.' Heat conductivity is the same as wood and the specific heat is 0.228 (wood = 0.4). It is made by mixing finely ground calcium sulphate (80 per cent through a mesh of 10,000 per square centimetre) with a catalyst, to form the bottom layer, and by mixing the basic material with sand and sawdust for the top layer. A colouring substance on an iron oxide basis gives it a red-brown colour.

A mineral wool for heat insulation is also made on an anhydrite basis. The most useful heat insulator the East Germans have so far developed, however, is 'Piatherm,' made on a urea basis. It is vermin-proof, non-inflammable and has an exceptionally low weight (1 cubic metre weighs 13 kg., specific weight = 0.013). One application is in material testing plants.

In the manufacture of films the Agfa-Wolfen factory is changing over the production process from the nitro to the acetate base. Production of films with emulsion suited to tropical conditions is also scheduled to begin soon. A development in photography shown at Leipzig is a rapid analysis for determining the silver content in fixing baths which is being used for the recovery of silver in large concerns in Eastern Germany.

Other branches of East German chemical production now being greatly extended are the manufacture of synthetic fatty acids from TTH-paraffin and the production, at the Jenapharm works, Jena, of TB medical drugs and vitamin preparations as well as penicillin. To meet export requirements, plans are in hand to expand the production of streptomycin at Jena next year. The pharmaceutical industry in the Eastern zone is virtually a new creation and certain chemical factories, including the Piesteritz nitrogen works, have actually switched over to a certain extent to the manufacture of medicines. Faced with the problem of registered trade marks, the East Germans were forced to 're-create' some internationally known special preparations. Various state-owned factories have undertaken the manufacture of 'Neo-arsoluin,' which is the same as salvarsan, 'Jenacain' (Novocain), 'Corvitol' (Coramin), 'Pentedrin' (Sympatol), and 'Deumacard' (Cardiazol).

Apart from new machines, the only recent departure in East German chemical equip-



An automatic drum-type chrome-plating machine for small nickel-plated parts

ment has been the use of Thuringian porcelain for HCl rectifying plants and plants making penicillin. Porcelain is regarded in such cases not as a substitute for alloy steel but as a new material. It has also been found suitable for H_2SO_4 plants.

Of Germany's huge reserves of natural potassium salts—greater than those of the rest of the world combined—about two thirds are in the Eastern zone. Exploitation has been greatly increased since the end of the war and at the present time Eastern Germany's potash exports are more than the entire pre-war German industry used to send abroad. Production of K_2O is now at the rate of 1,500,000 tons a year and under the five-year plan output of potassium salts is to increase by more than 100 per cent compared with the 1950 level. Mining methods are being improved and to facilitate exports, especially to the Far East, Wismar is being developed as a trans-shipment port for potash products.

Fertiliser Production

The East German industry is producing all types of fertilisers. Most important of the potash types is type 40 potash, with a 38 to 42 percentage of K_2O. Others are types 50 and 60 (48 to 52 per cent and 58 to 60 per cent K_2O respectively), potassium sulphate (with 48 to 52 per cent K_2O), and potash-magnesia.

The natural raw potassic salts, kainite ($MgSO_4$. KCl. $3H_2O$), containing 12 to 15 per cent K_2O, and sylvinite-kainite (16 to 20 per cent K_2O), are also produced, as well as an intermediate product between kainite and the type 40 potash fertiliser—type 30, with 28 to 32 per cent K_2O. The most recently developed products of the East German industry are potash-magnesia fertilisers containing, in addition to potassium in its various compounds, magnesium as a sulphate. These include 'Emgekali,' with 33 to 37 per cent K_2O, at least 15 per cent of magnesium sulphate and a percentage of boron corresponding to up to 0.2 per cent boric acid B_2O_3; 'Reformkali,' containing 26 per cent K_2O and 26 per cent magnesium sulphate, with a maximum 12.5 per cent chlorine—the low content of chlorine being due to the fact that half of the potassium is chemically in combination with the sulphate; magnesia-kainite, which contains 12 to 15 per cent K_2O and a minimum of 15 per cent magnesium sulphate; and magnesia-sylvinite-kainite containing 16 to 20 per cent K_2O with a minimum 15 per cent magnesium sulphate.

In addition, Eastern Germany is exporting nitrogenous fertilisers—sulphate of ammonia (20-21 per cent nitrogen), calcium ammonium nitrate (20-21 per cent nitrogen), and sodium nitrate (about 16 per cent nitrogen). The country is, however, deficient in phosphates and the East German delegate to the Moscow economic conference last April indicated his government's interest in importing phosphate fertilisers.

'Perlon' continues to be the most important of the East German synthetic fibres and output in the current year is being almost doubled. Comparable to nylon, it has unusual strength, lightness, quick-drying, and non-creasing properties. Its industrial uses are steadily increasing.

In the field of chemical equipment the East Germans are increasingly concentrating on the production of complete plants, and great emphasis was placed on this capacity of East German heavy industry in the extensive literature distributed at the Leipzig Fair. Complete paint and varnish plants have been supplied to Poland. A sugar factory has already gone to the Soviet Union and one is scheduled for delivery to China before the end of 1953. Negotiations to supply a third sugar plant to India were reported to have started during the Fair.

British Buyers Active

British buyers at the Fair were stated to have made purchases of special chemical equipment, and a number of individual machines, including a refining machine for paint and printing inks which was shown at the Fair and which had already been purchased by a Dutch buyer, were sold to Western countries. Delivery times quoted at Leipzig by representatives of the East German foreign trade organisation were 3 to 6 months for individual machines, 9 to 12 months for complete plants, and up to 14 months for cane or beet sugar factories. However, it was explained, the aim was to reduce delivery times still further for Western buyers 'because we are interested in expanding trade with them.' Eastern demands have been keeping the industry fully occupied, but the patent desire to increase exports of chemical equipment to the West was one of the most striking aspects of the Fair.

Netherlands Chemical Trade Fair

New Plant on View at Rotterdam

(FROM A DUTCH CORRESPONDENT)

RAPID growth in the Netherlands of the chemical industry and the increasing specialisation in engineering have for some time made apparent the advantages that could be gained from a trade fair or exhibition at which progress and development in design of apparatus and advances in plant for the chemical and allied trades could be brought together. It was felt that such a fair should also include exhibits and plant for the food-processing industry in view of its close association with chemistry.

As a result of keen co-operation of all those interested the first specialised trade fair 'Vochema, 1952' was created. Organised by the Royal Netherlands Industries Fair, 'Vochema' was held in the Ahoy'-Halls at Rotterdam from 21-29 October and was comprised of machinery and plant for the chemical and food-processing industries.

The fair, covering an exhibition area of 3,300 sq. m., was strongly international in character, no fewer than 12 countries with 330 exhibits in all, being represented.

A great number of Dutch machines and plants were seen for the first time in the Netherlands section which occupied one third of the total area.

Among the new items were:—A new air-conditioning plant, a synthetic resin revetment material for piping, laboratory building elements, dispensers, numerous new balances and weighing instruments, hygrometers, rollers for the paint and ink-making industry, new types of valves, crowns and fittings, filling and capsuling machines, ultra-violet liquid sterilisers, complete water purification plants, evaporating plants, centrifuges, homogenisers, heat exchangers, vats and tanks, an exhauster made of hard polyvinyl-chloride, flame photometers for rapid determination of K, Na and Ca, new insecticides, and so on.

In connection with the fair, an international congress was held, at which subjects in the fields of chemistry, industry, financing and calculation of building costs, laboratory equipment, and so on were discussed by Dutch and foreign experts. These gatherings attracted much attention, and provided a valuable opportunity for consideration of many of the problems which confront the chemical industry today.

A general view of the Fair

Britain Produces Cortisone

Home Demands Satisfied by 1953

THE welcome announcement of the first production of cortisone acetate in this country was made by Bayer Products Ltd., at a Press conference held on 11 November at the Waldorf Hotel.

Since cortisone was first used in medicine in England in 1949, mainly for rheumatoid arthritis, all supplies have been imported from the United States and have in turn been distributed by the Ministry of Health to selected hospital centres so that clinical evaluation could be carefully controlled.

The synthesis and manufacture of cortisone acetate by Bayer is the result of

Mr. E. Miller

collaborative research by Dr. C. M. Suter, Dr. S. Archer, and colleagues, working under the direction of Dr. M. L. Tainter, at the Sterling-Winthrop Research Institute, New York, and Mr. E. Miller and colleagues under Mr. H. C. Barney at the Bayer Laboratories, West Molesey, Surrey.

First delivery of cortisone acetate was made by Bayer to the Ministry of Health in October this year. It is hoped that by the middle of 1953 supplies will be sufficient to cover the present home demand and will allow a surplus for export which will be sold by Bayer's sister exporting Company, Winthrop Products Ltd. There is no likelihood, however, at the moment, that individual requests for cortisone can be met, since it has been agreed that all supplies will be taken up by the Ministry of Health for some considerable time.

* Still an expensive drug, cortisone has been considerably reduced from the original price of £30 per gram to about £4 per gram.

The availability of sufficient supplies of a starting material has been the main difficulty facing large-scale production, and that being used for manufacture at the present time is the steroid substance desoxycholic acid, derived from ox-bile, which although satisfactory, contributes largely to the expensive nature of cortisone.* A great amount of research has been and is being undertaken to find an alternative starting material but so far no more commercially satisfactory one has yet been discovered, although cortinsone acetate is being produced elsewhere from a few other sources (*see* THE CHEMICAL AGE, **65**, 347, and **66**, 773).

At the end of the conference mention was made of 'Telepaque' a new contrast medium containing approximately 66 per cent iodine given orally for visualisation of the gall bladder and extra-hepatic ducts. It has been found that 'Telepaque' has distinct advantages over pheniodol, having greater concentration in the gall bladder, enabling accurate diagnosis. It is also claimed that there is considerable reduction in the number and severity of side-effects. 'Telepaque' is described as 3-(3-amino-2,4,6-triiodophenyl)-2-ethyl propanoic acid.

Liquid Sulphur Dioxide Plant

Canada's first plant for the manufacture of liquid sulphur dioxide has been brought into production at Copper Cliff, Ontario, by Canadian Industries, Ltd. The plant will have an output of 90,000 tons a year, the equivalent of 45,000 tons of elemental sulphur. The project is the result of collaboration with the International Nickel Co., of Canada, Ltd.

Tasmanian Zinc Project

An expansion costing £A4,000,000 is planned by the Electrolytic Zinc Co. of Australasia, Ltd., at Risdon, about four miles from Hobart, Tasmania. Existing plant is to be extended and will then cover about 60 acres. In addition to the production of about 80,000 tons of zinc annually, the plant will produce more than 100,000 tons of sulphuric acid, and 50,000 tons of sulphate of ammonia a year.

British Gas Industry Survey

Progress Hampered by Limitations of Material & Capital

AMONG the chief pre-occupations of the Gas Council during the year ended 31 March, 1952, were the shortage of materials, particularly steel and cast-iron pipes, restriction on capital development, demands of the rearmament programme and the supply of coal.

The very serious effects arising as a result of the limitations in the amount of steel supplied to the gas industry, involving the postponement of much-needed replacements, and extensions, and even, in some cases, the cessation of work already in progress, are emphasised in the third report of the Gas Council, published last week.

Research again played a prominent part in the period under review. Much of the programme for the third year, like its predecessors, had of necessity been largely devoted to the continued developments of the organisation which the Council considered requisite for the discharge of its duty in the field of fundamental research.

Substantial progress had, however, been made with a number of specific projects on which the Research Stations had been engaged.

Expenditure on research by the Gas Council amounted to £137,555, an increase of £86,971 over the previous year. This figure by no means represents the total expenditure of the industry on research and development, for to it must be added the sums spent by the Area Boards and by the manufacturers of plant and appliances.

Second Research Station

The Council's second Research Station was established during the year at the Nechells Gas Works, Birmingham, and will be controlled by the West Midlands Gas Board. For the present the major task of this station under its director, Dr. F. J. Dent, will be the continuation and extension of the research into complete gasification processes previously conducted by the Gas Research Board in its laboratories at Poole, where the work will remain until the stage has been reached for its transfer to Birmingham.

Work was continued in accordance with the programme set out in the Council's second report. Some of the more important investigations included:—

(*a*) *Efficiency of Carbonisation.*—Investigations have continued with a view to improving the efficiency of normal carbonising plant, including studies of the effect of any modification in taper or other features of design of continuous vertical retorts and the use of a Geiger counter to follow the passage of a radioactive cobalt tally through such retorts. Investigations are also being made into the carbonisation of coals having weaker coking properties than those normally used for carbonisation.

(*b*) *Efficiency of Water Gas Production.*—The use of pre-heated air and steam was being studied with a view to improving the efficiency of water gas production.

(*c*) *Complete Gasification.*—Hydrogenation plant originally constructed by the Gas Research Board was being modified for fluidised operation and a small Lurgi plant was being constructed at the Birmingham Research Station. Until the completion of that plant, arrangements had been made for selected British coals to be tested in a Lurgi plant in Germany.

(*d*) *Production of Peak Load Gas.*—Research, begun by the North Thames Gas Board and continued in the London Research Station had resulted in the design and construction of a peak load oil gas plant. By the end of the year the plant was being continuously operated and a study made of its performance.

(*e*) *Purification.*—The preparation of artificial iron oxide for use in conventional purifiers was being studied. A process for the large-scale manufacture of an alternative purifying material, using waste copperas, had been developed. Other investigations were being made to improve the normal method of purifying gas by means of iron oxide. Processes for the liquid purification of gas were being investigated, and, in this connection, a catalytic process for the hydrolysis of hydrogen cyanide had been developed in the London Research Station. A pilot plant had been installed by the Koppers Company in the U.S.A.

(*f*) *Recovery of Sulphur.*—A pilot plant had been constructed for the recovery of

high-grade sulphur. It is hoped from information obtained from it to design a larger plant.

(*g*) *Disposal of Liquor Effluents.*—Research had continued into the use and disposal of ammoniacal liquor in collaboration with the Water Pollution Research Board, Drainage Board and Local Authorities.

(*h*) *Flame and Combustion.*—Studies were being carried out of the structure, stability and aeration of flames, the combustion characteristics of gas and the mechanism of energy transfer from flame gases to solids. It is hoped that these may lead to an increase in the efficiency of burners and appliances.

(*i*) *Measurement of Gas.*—A technique had been established for the conduct of accelerated life tests on gas meters.

(*j*) *Domestic Use of Gas.*—Investigations were continued to improve the various uses of gas and coke in domestic premises.

(*k*) *Industrial Uses of Gas.*—A technique had been developed for studying flow patterns in combustion chambers and flues which could be applied as and when individual problems arose.

A Research Liaison Committee had been formed under the chairmanship of Mr. W. K. Hutchison, consisting of the directors of the Research Stations, the Livesey Professor of Leeds University, and one of the senior scientific or technical officers from each Area Board.

This committee had no administrative function, but had been appointed to keep each Area Board closely in touch with the progress of research, and to keep the directors of research of problems arising in the industry. By this means a direct link had been provided between those responsible for conducting research and those who were responsible for applying the results to the operations of Area Boards.

During the year discussions were continued between the Gas Council and the Gas Research Board for the transfer to the Council of the work and assets of the board. Representatives of the Department of Scientific and Industrial Research and of the Society of British Gas Industries also took part in these discussions, as the outcome of which the transfer took place on the voluntary winding-up of the board on 26 June, 1952.

The Gas Council in their report pay tribute to the vision of those who were responsible for the foundation of the Board in 1939 and who thus pointed the way to co-operative research in the gas industry. The Council also expressed its appreciation of the work of Dr. J. G. King, O.B.E., as director of the Board.

Interests of the supply side of the gas industry and the interests of the manufacturers of plant and appliances are mutual and complementary, and it is to the obvious advantage of both that collaboration between them should be as close as possible at all stages. With this object in view the Council and the Society of British Gas Industries (as representing manufacturers of plant and appliances) had discussed how best co-operation in matters of research could be effected.

As a result a plan for collaboration had been accepted which, while paying due regard to the fact that the problem of securing co-ordination within the gas supply industry had been solved by nationalisation, recognised also that the society remained an association of firms in competition with one another.

The plan therefore embraces (A) research work reserved respectively to the Gas Council and to individual member firms of the Society of British Gas Industries; (B) research undertaken by mutual arrangement between the Gas Council or the Area Boards and one or more individual firms; and (C) research offering scope for collaboration between the Gas Council and the Society of British Gas Industries on a group basis.

Committee Established

To provide the means of direct collaboration under the third of these headings a Joint Consultative Committee on Research had been established, consisting of representatives of the Research Committees of the Gas Council and the Society of British Gas Industries in equal numbers. This Joint Committee, which was a policy committee, was not tied by precise terms of reference but was free to discuss any research matters that either party might suggest. It was expected, however, that the committee would select subjects which showed promise as fields for co-operation and that these subjects would then be remitted to research panels for study and to research teams for prosecution.

The Research Committee of the Society of British Gas Industries would use the machinery of the society to secure the service on the panels and teams of appropriate persons from member firms and generally would act

in a liaison capacity on research matters between the Gas Council on the one hand and the Society of British Gas Industries Council and members on the other.

Dr. H. Hollings, O.B.E., F.R.I.C., M.Inst.Gas.E., F.Inst.F., had retired from his appointment as director of the London Research Station and had been succeeded by R. H. Griffith, B.A., D.Phil., who was the senior chemist at that station. Dr. Griffith had accordingly become a member of the Research Committee.

Coal carbonised during the year totalled 27,421,800 tons, compared with 26,368,700 tons in the previous year. The production of water gas was reduced by 8.5 per cent. Because of its expanding requirements, and the limited amount of better carbonisation coal available, the industry still had to receive an increasing quantity of coal which was less suitable for gas making.

Some carbonisation coals went to other markets: it seemed desirable, therefore, that all suitable coals should be retained for use by the carbonisation industries. More strongly coking coals might be blended in some degree with other types, and the subject was being considered by a Joint Committee of the Gas Council and the National Coal Board.

Considerable quantities of methane were being collected and distributed from coal mines on the Continent, and it seemed likely that increasing quantities of such gas might become available from the mines of the United Kingdom. A Joint Committee of the National Coal Board and the Gas Council had been appointed to examine the possible uses of this gas in the national interest.

Butane/Air Installation

The butane/air installation, to which reference was made in the Second Report, came into operation during the year at Whitland, Carmarthenshire, and had worked efficiently. The economical application of the process would be governed by the prices ruling for butane, and until negotiations with the oil companies were successfully completed development at present must be restricted.

It had been decided by the Wales Board to convert to butane/air supply a further undertaking, Fishguard. The Eastern Board was erecting butane/air plants at Bungay and Framlingham which should be in operation before the close of 1952.

During the year 12,434,000 tons of coke were produced and 2,707,000 tons of breeze. Sales totalled 10,402,000 tons of coke and 1,385,000 tons of breeze. Present limitations of capital expenditure and materials were delaying the introduction of new coke plant which was needed for its better preparation and handling.

Technical work on the development of coke-burning appliances for both domestic and industrial uses had been actively pursued by the Coke Department of the Council throughout the year.

On the industrial side there had been a steady increase in the use of chain grate stokers burning coke breeze in Lancashire and Economic boilers. They gave a high efficiency with a minimum of labour and had resulted in a steady decline in stocks of coke breeze. New types of coke stokers had been and were being developed for central heating boilers which had an efficiency up to 78 per cent in everyday use.

Semi-Producer Furnace

A semi-producer furnace designed by the Gas Council was being increasingly used for industrial heating and process work. This was the only hopper feed furnace suitable for using large coke and had an efficiency of 85 per cent when used for direct drying. Work had begun on the development of this furnace to operate at temperatures up to 1,200°F. for industrial processes.

There was now a wide variety of hopper feed coke furnaces which would operate for long periods without attention, but there was still a need for mechanical means of charging hoppers and of reducing labour in the cleaning of fires and in the removal of ashes.

The industry was fully alive to the need for efficient preparation of coke. New screening and handling plant and extensions to existing plant were required in many cases, but present limitations of capital expenditure and materials caused delay in completing the necessary improvements.

Demand for the chemical by-products of the gas industry continued at a high level, and in some cases had exceeded the supply. Prices generally increased, and business was brisk, but the export of some commodities was restricted. Competition from the Mid-European by-products industry was beginning to influence world markets.

Crude tar sold during the year amounted to 1,493,000 tons, of which the greater part

was for refining by co-operative and other distillers.

The market for Coal Tar Fuel 200 (creosote/pitch mixture) continued to expand, and there was a good demand for pitch for briquetting.

A development of universal interest was the supply of gamma-picoline, a coal tar derivative needed for the preparation of the new drug used for treating tuberculosis.

Oxide Demand Drop

The market for spent oxide—one of the materials from which sulphuric acid is manufactured—was good for the greater part of the year, but there were signs toward the end of the period of a fall in demand as the world shortage of sulphur became a little less acute. The total quantity of spent oxide sold by the Boards was 224,000 tons.

Sales of sulphate of ammonia manufactured at the few larger works where ammoniacal liquor can be converted into that product reached a total of 80,000 tons compared with 71,000 in 1950-51. Controlled prices were advanced during the year to meet increased costs of transport and of sulphuric acid and to compensate for the removal of the Government subsidy on the manufacture of this product.

Experiments were continued in the use of crude ammoniacal liquor as an agricultural fertiliser and several boards report satisfactory results. The West Midlands Board, for instance, reported that experiments begun on farms around Redditch more than two years ago had proved so successful that there was now a regular and large demand from farmers in Worcestershire for their land to be treated with gas liquor. The Southern Board, last year sold some 984,000 gallons of liquor for agricultural purposes compared with 202,000 gallons in the previous year.

Similar experiments had been conducted by the Wales Board in association with the National Agricultural Advisory Services of the Ministry of Agriculture and Fisheries.

Since the end of the year it had been announced that, subject to certain conditions, ammoniacal liquor delivered on and after 1 July, 1952, for application to the land as a fertiliser would rank for subsidy, payable to the user, under the Fertilisers (England, Wales and Scotland) Scheme, 1952.

Crude benzole recovered amounted to 26,000,000 gallons. Of this quantity three-fifths were refined by the boards themselves. Most of the refined benzole was marketed as motor spirit by the National Benzole Co., Ltd.

Statutory prices for certain benzole products were advanced in July, 1951, to cover increases in refining costs, but the price of motor benzole remain unaltered. The excise duty on home produced light hydrocarbon oils was raised by 1s. a gallon in accordance with the Budgets of 1951 and 1952, both of which took effect during the year under review. The total excise duty was now 1s. 9d. a gallon.

During the year development had taken place on town gas burners, including the high intensity type used for flame hardening, brazing and general furnaceless heating; burners for immersion heating tubes for large-scale water heating; muffle shapes in high temperature furnaces; the behaviour of permeable linings for crucible furnaces; and the safety control of industrial appliances. Experiments had also been carried out on the design and development of flame traps and explosion doors in collaboration with the Factory Department of the Ministry of Labour and National Service; and progress had been made in the application of recuperated air to both forge furnaces and cremators.

Design of Special Plant

There was always a call on the board's industrial departments for assistance in the design of special plant to meet the particular requirements of individual consumers. Processes for which designs had been provided during the past year included the drying and varnishing of coloured labels, grain drying, the pre-heating of hot rolls in the tinplate industry, resin coatings on beer casks, cocoa bean roasting, forging and swaging of steel tubes, and lacquer drying on metal window fasteners.

Operating results of these plants had been circulated throughout the gas industry by the Industrial Gas Information Bureau.

In the section of the report devoted to a survey of the operations of the Area Boards it is again pointed out that progress in the replacement and extension of gas manufacturing plant and of storage capacity had been seriously delayed by the shortage of steel.

Elimination of Carryover

Packed Towers & Natural Draught Water Cooling Towers

ON 11 November a paper on the elimination of carryover from packed water towers with special reference to natural draught water cooling towers was presented to the Institution of Chemical Engineers at Burlington House, London, by H. Chilton, B.Sc., of the Chief Engineer's Department, British Electricity Authority. The following is an extract from it:—

Water cooling towers often cause light but objectionable local drizzle, usually termed 'precipitation.' The large reinforced concrete natural draught towers favoured in electricity generating practice have been regarded as particularly offensive and have occasioned serious complaint from the public. It was decided in 1948 that action must be taken to reduce precipitation from cooling towers to an innocuous level. The investigation described in this paper was undertaken to find how this could best be accomplished.

Wooton and Blum suggested that precipitation was mainly due to carryover of entrained droplets of circulating water. Subsequent experience has confirmed this view, so the alternative theory need not be discussed. It followed that droplet eliminators similar to those used in the chemical industry and in mechanical draught cooling towers which would reduce carryover would diminish the precipitation. This remedy was regarded with some misgiving, since there was reason to suppose that the resistance to airflow by eliminators of the usual design would have a disastrous effect on the cooling performance of a natural draught cooling tower.

Low Resistance Scheme

Limited pilot plant investigations by Imperial Chemical Industries, Ltd., in 1947 led to a low resistance scheme for reducing carryover, by avoiding splashing in the water distribution system and in the upper part of the packing.

In 1949 a natural draught tower at Darlington Power Station was similarly modified, and a satisfactory reduction in precipitation resulted without sacrifice of cooling performance. The programme of modifications contemplated was, however, so extensive that it was decided to make further pilot plant experiments on a rather larger scale. The apparatus was complete in the spring of 1950. Preliminary designs for eliminators were suggested a few weeks later and were fitted in several towers in the following months. Investigations were completed in the late summer, but the final recommendations could not be implemented until the summer of 1951, when some 30 natural draught cooling towers were altered.

Measuring Precipitation

Meanwhile a technique for measuring precipitation had been developed, and extensive tests were made both before and after some of the towers were modified. As a result an objective assessment of the effect of the modifications can be made. Not less important in practice is the subjective reaction of the public. In every case no further complaint from the public was received after all offending towers on a site were modified In a few instances former complainants have expressed their appreciation of the reduction in precipitation. Operating experience with most of the modified towers includes the winter of 1951-52, which, although not severe, had several frosty days at various times.

Systematic measurements of precipitation were made both before and after some of the towers were modified. The rate of precipitation, even under worst conditions, was not heavy enough to be measured accurately with a rain gauge, so a method of measurement due to P. Lenard (*Met. 2., Braunschweig*, **21**, 249, 1904) was developed. The results of these measurements are expressed in thousandths of an inch of water precipitated per hour. Four experienced observers were asked to prepare tables independently to facilitate the interpretation of the data. Their replies were in reasonable agreement, and Table I has been prepared from them.

For nearly two years, daily series of precipitation measurements were made in the vicinity of the cooling towers at Grimsby and Halifax.

From the results of the tests at Grimsby a map of the district was marked to indicate

TABLE 1.—*Interpretation of Precipitation Measurements*

Precipitation rate, thousandth inch per hour	Observations	
Over 2.0	Highly objectionable	Wets ground and may cause puddles of water
1.0 to 2.0	Definitely a nuisance	Wets ground if humidity is high
0.5 to 1.0	Noticeable—opinions are divided on nuisance	Stains parked cars, windows and spectacles
0.2 to 0.5	Easily detected, but not obtrusive	Produces a slight tingling sensation on the face
0.02 to 0.2	Would normally pass unnoticed	Readily detected with sensitised papers
Less than 0.02	Unnoticeable to the senses	Difficult to detect with sensitised papers

the maximum rate of precipitation measured during each month.

There are three reinforced concrete towers at Grimsby, one of which was fitted with three layers of streamlined elements as an eliminator; the other two were fitted with the recommended louvre type eliminator. Three wooden towers on the same site were not modified, and they were probably the cause of a substantial proportion of the precipitation measured after the concrete towers were modified.

Monthly Averages Computed

At Halifax the monthly averages of the heaviest of each day's precipitation measurements were computed. Before the towers were modified precipitation was heaviest in the winter months. This applies equally to all other natural draught towers, and is due primarily to the high air rate which can be shown to result from high heat load, low ambient temperature and high relative humidity. Precipitation is further reduced in summer by evaporation of water carried over, which depends on the difference between the wet and dry bulb temperatures and the size of the drops. Under hot, dry conditions all the water carried out of the tower is usually evaporated before it falls to the ground.

The reduction in precipitation after the eliminators were installed is considerably greater than was at once apparent, because the increase in heat load, which almost coincided with the modifications, would otherwise have caused a much higher precipitation rate.

There are two reinforced concrete towers at Halifax, both of which were fitted with louvre type eliminators.

A large number of measurements were also made at various distances downwind from the towers in several separate tests before the towers were modified. After modification further similar tests were made on days on which the atmospheric conditions and tower load of the previous tests were duplicated as closely as was practicable. Results were presented as graphs of precipitation rate plotted against distance from the tower.

At Ocker Hill there are two reinforced concrete towers, both of which were fitted with three layers of streamlined elements. The towers at Nechells 'B' station were fitted with louvre eliminators of the recommended type. There are no wooden towers at either of these stations.

Other Applications of Results

The carryover measurements were intended primarily for comparative purposes. If similar eliminators are used in other applications, different net carryover and effectiveness should be expected. The results will be of the right order, however, for applications where the entrained drops are fairly large, such as those from splash distribution systems and packing. Finely atomised liquids and condensation fogs have smaller drop diameters, and their removal presents more difficult problems which will not be discussed.

Resistance measurements on the louvre type eliminators depended partly on the way in which these were installed in the tower. All louvre eliminators were tested initially with the air directed towards the tower exit after leaving the top layer.

Conclusion

Two-layer louvre eliminators are very satisfactory for removing from a gas stream the relatively coarse droplets entrained in splash distribution and packing systems as used for water cooling and other towers. In special cases a single layer of louvres may suffice.

To produce an economical design for a given application, the pitch, louvre angle, louvre width and the relative positions of the layers must be selected with care. The design recommended for use in natural draught cooling towers (scheme 19 in the original paper) has been extensively applied and tested in practice. It appears to be satisfactory.

MIDLANDS SOCIETY FOR ANALYTICAL CHEMISTRY

Applications of Absorption Spectroscopy

FOLLOWING on the September symposium, the Midlands Society for Analytical Chemistry recently held its first ordinary meeting of the session in the Edmund Street Buildings of Birmingham University. The subject chosen for discussion was: 'Some Applications of Absorption Spectroscopy to Analysis' and it was introduced by two speakers from the Dunlop Research Centre.* Erdington, Birmingham.

C. E. Kendall, B.Sc., A.R.I.C. opened the discussion with a short talk on the uses of ultra-violet and visible absorption spectroscopy in qualitative and quantitative analysis, and described some applications of the technique to research and production problems in the rubber industry.

W. H. T. Davison, M.A. (Cantab.), continued the discussion with a talk on the principles, techniques and applicability of infra-red spectroscopy to analysis. Mr. Davison illustrated his remarks by mentioning some of the problems encountered in an industrial research laboratory.

Mr. Kendall's talk was as follows:—

The applications of ultra-violet and infra-red absorption spectroscopy to both research and analytical problems have rapidly extended during the last ten years, mainly as a result of improvements in instrumentation. This expansion, especially with ultra-violet spectroscopy, has been closely connected with the availability of commercially made photoelectric quartz spectrophotometers. The first of these was the Beckman, produced in the United States during the war; two British firms have marketed similar instruments in the last two or three years. These instruments have largely replaced photographic methods, and have resulted in a reduction in cost with much greater convenience in use.

Absorption of a quantum of visible or ultra-violet radiation by a molecule causes an electronic transition. In the visible (ca. 700 to 400 mμ) and the near ultra-violet (ca. 400 to about 200 mμ—the latter being the short-wave limit of quartz instruments) regions of the spectrum, the transitions are mostly those of π electrons of conjugated systems; electrons of σ bonds and π electrons of isolated double bonds have absorptions mostly below 200 mμ, not accessible with the normally available instruments. The fact that some materials are transparent in the near ultra-violet region means that several types of good solvents are available. Especially important are the paraffins and aliphatic alcohols. In the infra-red region, where virtually everything absorbs, solvents present greater difficulties and the limitation in range of applicability of working in the near ultra-violet often turns out to be an advantage.

Most ultra-violet absorption work is done in solution. If the instrument is in good condition and suitable ranges of optical density are used, instrumental deviations from Beer's Law can generally be avoided, and quantitative analysis is facilitated. Electronic spectra often involve very intense absorption, with molar extinction coefficients of the order of 10,000-100,000, so that for most work very dilute solutions down to 10^{-4} molar) are commonly used.

Basis of Identification

Identification of substances is based on comparison with spectra of known compounds, using such features as wavelength and intensity of absorption maxima, width of bands and amount and resolution of vibrational structure. Compounds with similar chromophores will normally have similar spectra, but minor changes such as differences in number and positions of alkyl groups cause small but usually recognisable differences. In many cases several components of a mixture can be recognised individually in the spectrum. Where direct identification cannot be made because of masking of one component by another, some separative procedure is necessary, e.g., paper chromatography or solvent extraction.

For quantitative analysis, an examination of the spectrum will usually suggest the method to be used for estimating the concentrations of the different components from the spectrum. Where only one component of a mixture has selective absorption in any region of the spectrum, a simple base-line method can often be used, as in the normal

* Acknowledgment is made to the Dunlop Rubber Company for permission to publish this report.

methods used for the estimation of Vitamin A. In general, however, multicomponent methods are required. As long as Beer's Law holds, the absorptions of the separate components at a given wavelength will be additive: i.e.,

$$D_i = \Sigma \epsilon_{ij} . C_j$$

where D_i is the optical density of the mixture at wavelength i, ϵ_{ij} is the extinction coefficient at wavelength i of component j, and C_j the concentration of component j. For a system of n components, a set of n wavelengths are chosen to give the best differentiation between the components, and the set of simultaneous equations is solved for the concentrations required. An excellent example of the application of this technique is the estimation of benzene, toluene, ethylbenzene and the three xylenes in mixtures containing all six, as described by Tunnicliff, Brattain and Zumwalt (1949).

Applications in Rubber Industry

A few examples of the practical applications of ultra-violet spectroscopy in the rubber industry helps to show the types of problems which can readily be tackled. The most obvious uses are for analyses involving accelerators and antioxidants, most of which have strong ultra-violet absorption. As with other methods of analysis, the detection of accelerators and antioxidants in vulcanised rubber requires an extraction with solvent to obtain them in a suitable form. Rates of diffusion of the various materials from rubber vary very widely and this can often be used to effect a partial separation of substances which would mask other components. For example, phenyl-β-naphthylamine is extracted from rubber much more quickly than many of the other rubber antioxidants, and this saves further separation when it is necessary to determine traces of this substance in the presence of much larger amounts of interfering materials. Thus, an overnight extraction of 10-20 mg. of rubber with 10 ml. alcohol extracts phenyl-β-naphthylamine quantitatively, and amounts of the order of 0.1 per cent or less of this substance can be determined in the presence of 2-3 per cent of *symm.* di-β-naphthyl-*p*-phenylenediamine, because only a small part of the latter is extracted in this time. The detection of phenyl-β-naphthylamine is important because it causes a severe staining in rubber, and of textiles in contact with the rubber, and therefore must not be used for many applications. The migration of phenyl-β-naphthylamine from rubber into, say, cotton fabric can readily be detected by solvent extraction. As little as 0.05 per cent of the substance on the fabric is quite easily determined, and much smaller amounts can be detected.

Most accelerators (e.g., dithiocarbamates, benzthiazole derivatives, etc.) can readily be determined, although in vulcanised rubber it is often necessary to determine the decomposition products rather than the original accelerator. Thus, a thiuram disulphide yields mainly the zinc salt of the corresponding dithiocarbamic acid, and choice of solvents for extraction is sometimes rather important because of the reactions which may occur.

The identification and estimation of accelerators in unvulcanised rubber is simpler, and routine methods by which one operator can handle up to 100 samples per day have been described by (Kress 1951). Identification of raw materials follows standard lines. Detection of impurities is often important. Thus traces of mercaptobenzthiazole present in benzthiazyl disulphide show up quite clearly in the spectrum, and no separation is normally necessary. Care in choice of the solvent is again necessary because several of the common solvents give some reduction of the disulphide. Tetraethylthiuram disulphide in sodium diethyldithiocarbamate can be detected by extraction with cyclohexane, and β-naphthol and mono-β-naphthyl-*p*-phenylenediamine in di-β-naphthyl-*p*-phenylenediamine can be determined by extraction with hot water.

Ultra-Violet Useful

Although polymers are in general examined by infra-red spectroscopy, ultra-violet spectroscopy is useful for some cases where the determination of a small amount of conjugated or aromatic material is involved. Thus, the determination of styrene repeating units in a butadiene-styrene copolymer is helped by the fact that the butadiene residues have little absorption except at the extreme short-wave end. Traces of free (monomeric) styrene in polystyrene or GRS can be estimated in quantities down to about 0.1 per cent (Newell, 1951).

In conclusion, the main features involved in applying ultra-violet spectroscopy to analysis may be summarised. Analyses can often be made much more quickly than

by chemical methods. In general, very little developmental work on analytical methods is necessary, and this is very important in non-routine work covering a wide range of materials. Analyses can very often be made directly on a solution without separations or preparation of derivatives. Multicomponent analyses can be made quite readily. Where derivatives have to be made, it is often possible to make several determinations simultaneously, e.g., the determination of several metals in the form of their complexes with a suitable reagent.

In some cases spectroscopy can be used where no chemical methods are available. Where strongly absorbing materials are involved, quantities of the order of a few tens of micrograms can be determined accurately, and these quantities can be reduced by using microcells. Whether to use ultra-violet or infra-red spectroscopy or some other physical or chemical method needs consideration for each type of problem on the grounds of economy of time, accuracy, cost, etc., but the versatility of spectroscopic methods is an portant factor.

Mr. Davison continued with the following remarks on infra-red spectroscopy:—

Although the term infra-red covers electromagnetic radiation from the visible to microwave, the region most commonly used is that of a rock-salt prism, i.e., 2-15 microns or 5,000-650 cm.$^{-1}$ All covalent compounds other than diatomic homo-molecules have infra-red absorptions in this region, and consequently the technique is of almost universal application.

Frequencies of Absorptions

The frequencies of absorptions are those of the vibrations of the atoms within the molecule (together with combinations and harmonics) and their intensities are dependent upon the change of dipole moment involved in the vibrational mode. Although for simple molecules these can sometimes be calculated from the masses of atoms and the force-constants of the bands, for most compounds of industrial interest this is not possible. In such cases, many correlations between characteristic frequencies and structure or groups have been established (Thompson, 1948) which permit the identification of groups such as -OH, -NH, -CN, -NC, -SH, C=O and larger groups such as olefinic substituents and aromatic nuclei. In addition to absorptions which may be identified with definite groups, there are always a number of other 'skeletal' absorptions which are not so related and in fact are specific to the individual molecule. These skeletal absorptions enable even the differentiation of positional isomers.

Design of Spectrometer

The design of a spectrometer will not be described, since modern practice is to use standard commercial models such as the Grubb-Parsons used in the Dunlop Research Centre Laboratories. The end-product of the spectrometer is a plot of transmission against frequency known as a spectrogram. Materials may be examined as gases, liquids or solids; in the latter case they may be polymer films, melts, solutions or mulled in paraffin to reduce scatter. In practice, infra-red absorptions are limited by the use of rock-salt for cell windows and wherever possible of non-polar solvents such as carbon tetrachloride and carbon disulphide, because of the almost universal absorption of infra-red radiation. The analytical applications rely qualitatively upon the unique character of the spectrum of a compound (although this is modified slightly by solvent, association and crystallinity). By measurement of the intensities of suitable absorptions quantitative analysis is possible, using synthetic mixtures or pure compounds for the analytical curves; Beer's Law is generally applicable.

Unlike most classical methods of analysis, the technique for qualitative and semi-quantitative analysis is completely general (apart from preparation of a suitable sample) and requires a minimum of development, since published spectra are in general adequate for reference. For quantitative analysis, however, it is essential to calibrate the analytical curve for one certain instrument, since reproducibility of exact intensities between different spectrometers is poor.

An advantage of the technique is that it requires samples of only 0.001-0.01 g. (and using microspectroscopy, of the order of 10^{-6} g.); in practice, the lower limit is set by handling rather than instrumental difficulties and even these small samples can be recovered unchanged. The accuracy of determinations varies but is usually around 1 per cent, and the speed is generally much greater than by chemical methods; using a double-beam instrument the complete spectrum can be recorded in about 13 minutes.

For polymer analysis the technique is particularly valuable since the material is examined as it is, without prior chemical degradation such as pyrolysis or hydrolysis; this obviates assumptions as to the original structure from its decomposition products. For many copolymers the spectra are substantially those of equivalent mixtures of homopolymers. While this is a limitation, it simplifies construction of analytical curves. Furthermore, spectra of high polymers are almost independent of molecular weight and only slightly affected by cross-linking.

Single Spectrum

It should be stressed that a spectrum is a multi-parameter measurement, and a single spectrum is therefore equivalent to a very large number of single-parameter determinations such as refractive index, density, elemental composition, solubility, etc. Thus a single spectrum may give information on polymer composition (including modes of addition of monomers), crystallinity, oxidation, cross-linking and molecular weight; end-groups can usually be determind independently.

The general procedure for examining polymers is first to remove non-polymeric material (extraction, or solution and separation of fillers), then to prepare a suitable film (or solution) and measure the spectrum. The substances are first identified by the use of characteristic frequencies and then by direct comparison with reference spectra. For quantitative analysis of mixtures of copolymers, the spectrum is re-measured under standard conditions and the composition either read from an analytical curve, or calculated from the spectrum data. Following are some examples of analyses of various polymer classes. Elastomers have been examined by Dinsmore and Smith (1948) and are usually extracted with acetone or alcohol dissolved by refluxing in *o*-dichlorobenzene and centrifuged or filtered with filter aid to remove filler or carbon black. The solvent is then removed by vacuum distillation to give a viscous residue which is spread on rock-salt and dried in an oven. Compositions which can be determined to about 1 per cent accuracy are styrene-butadiene copolymers (e.g., GR-S) in natural rubber, acrylonitrile in any mixture or copolymer (investigated by Davison and Smith), and methyl *iso*propenyl ketone/butadiene copolymers investigated by Davison and Bates (unpublished work). Gutta/rubber and cyclised rubber/rubber mixtures have also been measured by Davison and Bates to an accuracy of about 5 per cent; this lower accuracy reflects the close similarity of the spectra.

Polyacrylates can generally be purified by solution in acetone and precipitation with petrol. In addition to the polymer films, the pyrolysates give supplementary information in the case of methacrylates (described in the literature by Haslem and Soppet, 1950). Polymeric methyl, butyl and cyclohexyl methacrylates can be readily distinguished and the proportions determined in copolymers or mixtures.

While there is insufficient published material on phenol- and urea-formaldehyde resins for easy identification by infra-red, it is highly probable that, with development, the infra-red analysis of such materials could be effected; occasional samples have been identified by infra-red, at the Dunlop Research Centre, although at present the position is far from satisfactory. Even insoluble resins can be examined, by powdering and mulling in paraffin. The spectrum reflects both constituents and degree of condensation. In the case of chlorine-containing polymers, where the chlorine content is inadequate to distinguish between polychloroprenes, polyvinyl and polyvinylidene chlorides, chlorinated and hydrochlorinated rubbers, chlorinated polyethylenes, etc., the spectra are once more distinctive, and can be used for analysis.

Analysis of Polymers

Another interesting case is the differentiation and analysis of polymers of acrylonitrile, cyanoprene and vinyl pyridines. Polymers of the first have a normal nitrile absorption, those of the second show a conjugated nitrile with a lower frequency, and those of the third, of course, give no nitrile absorption. Davison and Bates have tentatively attributed absorptions at 1,476, 1,148 and 748 $cm.^{-1}$ to the vinyl pyridine repeating unit.

It was mentioned earlier that in general a polymer has a spectrum which is affected by crystallinity. Examples of polymers with distinctive crystallinity bands are α- and β-gutta described by Sutherland and Jones (1950) and the polychloroprenes and polybromoprenes investigated by Mochel and Hall (1949). Natural rubber shows spectral changes but they are too slight for analytical

use. Except for using these differences to measure crystallinity, one must be careful in such cases to work with a standard state, usually that of the amorphous material.

Infra-red Valuable Technique

In conclusion, it can be stated that infra-red is a very valuable analytical technique especially for qualitative and semi-quantitative analysis of organic materials. Where a wide range of materials needs to be covered, its main advantage is probably that a minimum of development is required. For more precise quantitative work some initial development is required but the speed of subsequent routine analyses is usually superior to other methods.

In the general discussion, several interesting points were raised. It was mentioned earlier that extinction coefficients and calibration curves in infra-red work must be obtained using one instrument and that reproducibility among instruments was usually poor. In general, the same may be said for ultra-violet spectroscopy; the greater range of available solvents in ultra-violet work leads to a further variable, and extinction coefficients are only roughly transferable for substances in different solvents.

Infra-red spectroscopy has been used for the elucidation of the position of substituents in organic compounds. One problem of this nature is the placing of the sulphonic acid groups in compounds of the dinaphthyldiamine series. Chemical reactions of these compounds indicate that the sulphonic acid substituent is contained in either the 6- or 7-position in the naphthalene nucleus. It seems possible that an infra-red examination of α-naphthylamine sulphonic acids, where the positions of the sulphonic acid groups are known, would give empirical data of great value for comparison with the data obtained from the spectrum of the sulphonic acid derivative of the dinaphthyl compound. Unfortunately, little work has been done on the spectra of these naphthalene derivatives although it would be valuable to build up libraries of reference spectra for such comparisons. The limitation on choice of solvent is a major factor and it may be that these acids are not readily examined by the present-day methods. More accurate information would perhaps be obtained using methyl-substituted naphthylamine sulphonic acids, the methyl group occupying the same position as that of the bond between the nuclei in the dinaphthyl compound.

Although most spectroscopic work is done on solid or liquid materials, the spectroscopic examination of gases is often very much easier. A single fixed cell can be used and gas concentrations can easily be adjusted. Very sharp bands are usually obtained on the spectrogram. In infra-red work, shifts in wavelengths are observed for the different carbon-halogen bonds and mixtures of halogenated substances can readily be analysed.

The inorganic applications of ultra-violet and visible spectroscopy are too numerous to mention here. Most inorganic work has been done in the visible region of the spectrum, more for convenience, as inorganic substances, especially elements, have convenient absorptions in the visible spectrum. It is possible to analyse mixtures of metals by forming their complexes with organic reagents and obtaining their spectra either by ultra-violet or infra-red excitation. A comprehensive paper by Miller and Wilkins on the infra-red spectra of inorganic substances has recently been published. Such data should prove of value in the solution of problems involving inorganic salts.

Developments in Brazil

'PRODUCTOS Quimicos Elekeiroz' has acquired complete equipment in Germany for plant to manufacture phthalic anhydride from crude naphthalene. The latter will be supplied by the coke ovens of the National Steelworks at Volta Redonda. Phthalic anhydride is now in great demand in Brazil by manufacturers of paints, varnishes and plastics, but has hitherto had to be imported. Imports have increased from 78 tons in 1948 to 475 in 1951 and requirements in 1952 are estimated at 600 tons. The Elekeiroz plant will use Badische Anilin patents and the German organisation will supply the necessary equipment.

A joint stock company, 'Rilsan Brasil S.A.', is being organised in Sao Paulo to manufacture synthetic materials, including textile yarns, with castor oil as the basic raw material. The new enterprise will compete with 'Companhia Nitro-Quimica Brasileira,' which is building three factories, in association with French industrialists, to manufacture synthetic and organic yarns of polyamide type.

The Chemist's Bookshelf

ENGINEERING DRAWING. By H. T. Davey and R. J. Wilkins. Macdonald & Co. (Publishers), Ltd., London. 1952. Pp. xix + 392. 45s.

The authors have planned this book to give sufficient material to cover a two-year course in the subject. It is a comprehensive book supplemented by a large number of diagrams, drawings, and exercises for the student. The first two chapters deal with drawing office routine and drawing instruments and their uses.

The importance of geometrical drawing and its applications is emphasised throughout the book. Thus Chapter 3 commences with definitions of shapes and geometrical forms of figures and bodies commonly met with in engineering practice. Useful geometrical constructions including the ellipse, parabola, hyperbola, and polygon are explained and illustrated. At the end of Chapter 4 oblique and isometric projections are introduced, but are fully dealt with in Chapter 12. Isometric projections are illustrated for curved surfaces and solids. This is followed by oblique projection and auxiliary views (including methods of obtaining true shapes of sections and solids). Under the section headed 'loci' constructions are given for finding the paths of points on moving parts of machine members. Chapter 14 is concerned with the construction of intersection curves and developments of practical engineering problems.

The fundamental principles of engineering drawing are considered in great detail from the linework to the finished job. Chapter 4 deals mainly with orthogonal (1st and 3rd angle) projection, whilst in chapter 6 the complete production of engineering drawings is described. This includes lettering, dimensioning, surface finish, and recommended abbreviations for engineering drawings. The next chapter continues this topic with the drawing of sectional views.

Not only have the authors gone into the subject of engineering drawing fully, but they have included a considerable amount of general engineering descriptive matter. Thus in chapter 8 screws and screw threads (including forms and proportions of threads), types of nuts and bolts, and locking devices are described and illustrated. In the ensuing chapters bearings, lubrication, keys, cutters, couplings, pipe joints, and valves are all considered in detail. The subject matter of Chapter 15 is gears, profiles of gear teeth, proportions terms relating to gears and geometrical construction of gear teeth.

Rivets and riveted joints come in Chapter 16 which appropriately precedes the chapter on structural drawing. By including chapters on structural drawing and elementary principles of design the authors have broadened the field of application of this book. However in one chapter on design it is only possible to give a fleeting glimpse of this vast subject.

Besides the numerous machine drawing and geometrical exercises given throughout the book there is an appendix consisting of some 30 exercises on orthogonal projection of varying grades.

Reviewing the book as a whole there is a lack of uniformity in both the line thickness and dimensioning of the illustrations. While the authors quote for reference B.S.S.308. 1943 on Engineering Drawing Office Practice, this is not always followed in the dimensioning of the drawings. It would be a considerable enhancement to the book if an index was added after the appendix.—D. W. EMERY.

QUANTUM THEORY OF MATTER. By John C. Slater. McGraw-Hill Book Company, Inc., New York and London. 1951. Pp. xiv + 528. 64s.

There is no dearth of books and treatises which expound, at all levels of difficulty, the principles and methods of modern quantum theory. However, the literature on the application of quantum theory to various

topics on a wide basis is, in many respects, inadequate. Consequently, Professor Slater's new book, 'Quantum Theory of Matter,' which for the most part, covers a considerable amount of ground in fields rarely touched in texts on quantum theory, should be widely welcomed by physicists and chemists.

A difficulty with a work of this nature is the choice of a suitable starting point. In view of the number of texts available on wave mechanics, it may at first sight seem regrettable that the author elected to begin his book with a fairly elementary account of quantum theory, instead of using all the available space in treating a wider range of topics in greater detail. However, the neatness and clarity of these introductory chapters robs this criticism completely of its force. The theory is developed as far as the use of matrices and the study of perturbations, but here, as elsewhere throughout the main text, the mathematical complexity is reduced to a minimum.

It is obvious that before quantum theory can be applied to macroscopic systems, the simpler atomic and molecular systems must be thoroughly understood. Consequently, the author next deals with the hydrogen atom, the Hartree method for more complicated atoms, and the vector model for the structure of energy levels. Here the emphasis is not so much on spectra, a subject which is covered in many other texts, as on the features of atomic structure which are of importance in studying interatomic forces and the properties of matter in bulk.

A similar bias is noticeable in the treatment of the hydrogen molecule and molecular ion in a chapter which forms an excellent introduction to the London-Heitler method and molecular orbital theory. The subsequent pages deal with the whole range of interatomic and intermolecular forces—covalent, ionic and metallic bonds, and Van der Waals forces. A proper understanding of these processes from a quantal viewpoint is very essential to the modern chemist, and Professor Slater's volume should prove invaluable to those who seek a relatively simple account of these topics.

In his treatment of conductivity the author develops the energy-band theory—a method which is particularly powerful in the discussion of semi-conductors. A useful, but necessarily sketchy, survey of the chemical, mechanical and thermal properties of matter follows. The main text concludes with chapters on dielectric and magnetic effects.

An interesting feature of the book is the separation off into twenty-two appendices of some more difficult matter, such as the proof of Landé's formula, which had not been fully treated in the main text. This arrangement has the advantage of satisfying the more exacting student without making undue demands on the reader who is anxious to get an overall picture of the subject with the minimum of mathematical detail.

'Quantum Theory of Matter' should have a wide appeal among physicists and chemists and enjoy a popularity equal to, if not greater than, the author's 'Introduction to Chemical Physics,' which, to a large extent, it is designed to supplement.—P.K.C.

THE CLASSIFICATION OF FIRE HAZARDS AND EXTINCTION METHODS. By J. D. Birchall. Ernest Benn, Ltd., London. 1952. Pp. 97. 7s. 6d.

This is a useful little book. The author's purpose, as stated in his introduction, is to provide fire officers with details of the most suitable extinguishing agents for dealing with fires involving hazardous substances. The generally used classification of fires into three groups has been extended into seven groups and this has enabled a more precise selection to be made.

A generous amount of space is devoted to plastics, and the author's treatment is sound. He deals with base substances and plasticisers separately and also considers the usual solvents likely to be met with in this industry.

The treatment of chemicals appears at first sight to be rather sketchy but on further study is found to be reasonably complete. Its use would require some knowledge of chemistry and so will be more of a long-term guide to fire officers than a work of quick reference. One is a little surprised to find 'Turkey Red Oil,' usually a 'generic' term for a sulphonated vegetable oil, listed as insoluble in water.

The book is systematically planned and will give fire officers a large amount of useful information in a small volume and the author has therefore fulfilled his purpose. The book is well made and printed but as it is intended to be used as a work of ready reference, it could with advantage have been fitted with a more robust and rugged cover.—ALEC WEBSTER.

HOME

Air Pollution in Lancashire

Latest statistics show that in a month 50 to 70 tons of soot, grit and ash fall on every square mile in Bootle (Lancs). The health department, in co-operation with factory managements, has arranged courses to teach boilermen improved stoking technique and coal is being better graded. The department also insists that all new houses and factories have grates or boilers designed to prevent excessive smoke.

Cheshire Water Complaint

Excessive chlorine content of the drinking water in the Swanlow area was reported at a meeting of Winsford Council on 11 November. It was decided to draw the attention of the Mid and S.E. Cheshire Water Board to the complaint.

Combined Dinner

The combined annual dinner of the Chemical Society, the Royal Institute of Chemistry and the Society of Chemical Industry, was held in the Midland Hotel, Belfast, on Friday evening, 14 November. Professor J. H. Biggart, C.B.E., proposed the toast to the three chemical societies, and Dr. M. H. Hall responded. Dr. A. J. Kidney proposed the toast to the guests and Mrs. Mayne Reid and Mr. F. H. Ingram replied. The principal guests were Professor Biggart and Mrs. Biggart, and Dr. Cecil L. Wilson was in the chair.

Steel Output Record

The recovery in production of steel which began in August was continued in the following month with an output higher than any previous September. Figures for October, announced this week, at an annual rate of 17,044,000 tons, were also the best ever recorded for that month, and exceeded last year's rate for the same period by 1,415,000 tons. Production is benefiting increasingly from the new plant and extensions resulting from the post-war development plan of the industry begun in 1946. The annual rate for the 10 months of 1952 at 15,917,000 tons compares with 15,628,000 tons for the same period in 1951. Pig iron output was also higher in October at an annual rate of 10,616,000 tons as against 9,865,000 tons a year ago.

West Indies Mission

At the invitation of the Governments of Jamaica, Trinidad, British Guiana and Barbados, a party of British industrialists will undertake a mission to these territories to investigate the possibilities of further industrial development. Mr. Lincoln Steel, of Imperial Chemical Industries Ltd., has agreed to serve as leader of the mission.

London Selling Agents

Commercial production of a wide range of primary, secondary, and tertiary amines and their salts together with certain quarternary ammonium compounds has been begun by Liljeholmens Steatinfabrikens Aktiebolag of Sweden. These products have extensive potentialities in asphalt bonding, pigment wetting and grinding, anti-skinning in paints, and cationic emulsifiers in germicides. Samples and technical details are available from the company's sole selling agents, Guest Industrials Ltd., Raw Materials Division, 81 Gracechurch Street, London, E.C.3.

No Pay Rise in Chemical Industry

A claim for a wage increase of 2d. an hour was rejected on 13 November by the employers' side of the Joint Industrial Council for the Chemical Industry, on the ground that trade was decreasing and workers being made redundant. The unions concerned (the Transport and General Workers Union, National Union of General and Municipal Workers, and the Union of Shop, Distributive and Allied Workers), decided to refer the matter to the Industrial Disputes Tribunal.

Yorkshire Potash Search

Completion of the fourth bore in its North-East Yorkshire potash deposits is referred to by the chairman, Mr. F. G. C. Fison, of Fisons, Ltd., in his report for the year ended 30 June, 1952. This will complete the company's drilling programme, results of which have confirmed earlier expectations of extensive potassium salts. A report on the findings, made in conjunction with Imperial Chemical Industries Ltd., has been submitted to the Ministry of Materials.

• OVERSEAS •

Anglo-Canadian Paint Link-up

Roxalin of Canada, Ltd., announces that Pinchin Johnson & Associates, of London, has acquired a substantial interest in its company. Roxalin have manufactured specialised industrial finishes at New Toronto since May, 1947, and will continue under the present management.

Italian Sulphur Industry

The first financial backing to assist in the reorganisation and the replacement of obsolete equipment in Italy's sulphur industry has been authorised by the Italian Minister for Industry and Commerce. A total of some nine milliard lire is to be granted to 47 firms. Fresh deposits of gypsum and sulphur are reported to have been found near Caltanissetta and Agrigento and in the Marche and Romagna regions (Forlivese, Cesenate and Pergola). Search is being made for sulphur in Calabria and recent investigations in the Perticara mine are reported to have revealed strata with an estimated life of 10-15 years.

Venezuelan Acetate

The Celanese Venezolana S.A., a subsidiary of the Celanese Corporation of America, has in less than a year constructed a plant in Valencia at a cost of 20,000,000 bolivares for the production of acetate rayon. The construction of another plant near Caracas is planned at a cost of 6,000,000 bolivares for the production of 500,000 kilos a year of short stapled spun yarns. This second factory will also have the backing of the Celanese Corporation of America.

Fireproofing of Textiles

A method of flame-proofing textiles which, it is claimed, will withstand weathering and laundering, was described by Dr. George E. Walter, a New York chemical consultant, at the 122nd national meeting of the American Chemical Society. The starting compound used was triallyl phosphate, which on its own was of little flame-proofing value. The introduction of certain elements and groups—particularly those containing nitrogen or bromine or both—led to substances of remarkable flame-proofing effect, without impairing the strength or softness of the material.

Paint Research in Canada

A new research laboratory built by Canadian Industries, Ltd., was officially opened at York Township, Ontario, on 29 October. The three-storey building is operated in five departments by a staff of approximately 60, most of whom are chemists. Investigations are being carried out to improve qualities of paints and varnishes, to produce protective coatings, and other items such as plastic wood and adhesives.

Chlorophyll Research in U.S.A.

The use of chlorophyll for the treatment of heart ailments, high blood pressure and sinus trouble is being investigated by research workers at the National Chlorophyll and Chemical Company, Lamar, Colorado. The company is building a $1,000,000 factory which is expected to produce more than 100,000 lb. of chlorophyll a year. The entire output of chlorophyll last year was only 60,000 lb.

East African Oil Search

A thorough investigation of the East African coast for oil is to be carried out by the D'Arcy Exploration and Shell Exploration companies. Mr. B. M. Eager has arrived at Dar-es-Salaam to establish headquarters for the project. This follows a preliminary survey carried out last year by Dr. Kent and Dr. Kundig. There was no guarantee that any oil discoveries would be sufficient to warrant commercial exploitation.

Venezuela Produces Paraffin

At a cost of 11,000,000 bolivares the Philipps Petroleum Company has installed a plant in Venezuela for the production of paraffin. The plant has a production capacity of 2,270 tons a year, which is sufficient to supply half the industrial needs of the country. This is the first paraffin plant to be installed in South America. The company has already made its first sale of paraffin at a price somewhat lower than that of the imported product. The total investment amounts to 20,000,000 bolivares and provides for additional installations for the production of high octane petrol for aeroplanes, diesel oil and other by-products.

PERSONAL

H.R.H. THE DUKE OF EDINBURGH will be the Guest of Honour at the annual luncheon of the Parliamentary and Scientific Committee to be held at the Savoy Hotel, London, on 11 February, 1953.

The Royal Society announces that HER MAJESTY THE QUEEN has been graciously pleased to approve the award of the two Royal Medals recommended by its council for the current year. One of these has been awarded to:—

PROFESSOR C. K. INGOLD, F.R.S. (London) for his extensive theoretical and practical studies of the mechanism of, and the factors influencing organic chemical reactions; and for his analysis of the structure of benzene.

MR. W. G. T. PACKARD, who has completed 50 years of service with Fisons, Ltd., is retiring from the board.

Executives of four major divisions of Imperial Chemical Industries, Ltd., have been appointed directors of the company. They are MR. C. R. PRICHARD (chairman, Salt Division), MR. R. A. BANKS (joint managing director, Alkali Division), DR. JAMES TAYLOR (joint managing director, Nobel Division) and DR. RONALD HOLROYD (joint managing director, Billingham Divison).

The Distillers Company, Ltd., announces that MR. P. H. HOGG and MR. H. H. WOOLVERIDGE have been appointed directors.

MR. CHARLES FRANKLIN MERRIAM, chairman of British Xylonite, has been appointed a director of British Enka, rayon yarn manufacturers. British Enka is a subsidiary of Kunstzijde Unie, N.V., the Dutch synthetic yarn manufacturing group. Mr. Merriam is also a director of the Distillers Company. Earlier this year, although continuing as chairman of British Xylonite, he retired from active daily employment with the company after 47 years of service.

Following its annual general meeting held on 5 November, the British Colour Makers' Association announces that officers and council for the ensuing year will be:—*Chairman*: C. M. BEAVIS (Golden Valley Colours, Ltd.); *vice-chairman*: H. GOSLING (Cornbrook Chemical Co., Ltd.); *honorary treasurer*: E. G. A. COWAN (Cowan Brothers (Stratford), Ltd.); *council*: F. BURRELL (J. W. & T. A. Smith, Ltd.), A. S. CALLAGHAN (Imperial Chemical Industries, Ltd., Dyestuffs Division), J. H. GRIMSHAW (Horace Cory & Co., Ltd.), V. WATSON (Cromford Colour Co., Ltd.), H. A. WILSON (The Derby-Oxide & Colour Co., Ltd.), C. E. YOUNG (Hardman & Holder, Ltd.); *Secretary*: ALLAN J. HOLDEN.

SIR EDGAR SYLVESTER, K.B.E., has joined the board and been elected chairman of the Sierra Leone Development Company. A former governor of the Gas Light & Coke Company, Sir Edgar was chairman of the Gas Council from 1948 to 1951.

Key Industry Duty

THE Treasury have made an Order under Section 10(5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty from 20 November, 1952, to 18 February, 1953:—

Synthetic organic chemicals, analytical reagents, other fine chemicals and chemicals manufactured by fermentation processes, the following: D-α-amino*iso*valeric acid, L-α-amino*iso*valeric acid, carotene. N,*p*-chlorobenzyl-N'N'-dimethyl-N-2-pyridylethylenediamine hydrochloride (a salt of a substituted aminopyridine), dimethyl terephthalate, ethyl 4: 4'-dihydroxydicoumarinyl-3: 3'-acetate, N-*mono*ethyl-*o*-toluidine, guanine and thiophene.

Minerals in Beach Sands

The Australian beach-sands minerals industry in the State of New South Wales has developed to a stage where, in terms of value and output, it ranks third in the mining industries of the State. Value of output for the June quarter of this year was £A311,475, compared with £A225,171 for the same period of 1951. The industry is producing high-grade rutile, zircon, monazite and ilmenite concentrates from the black beach sands in the Northern coast of the State.

Next Week's Events

MONDAY 24 NOVEMBER

Society of Chemical Industry

London: 26 Portland Place, W.1, 6.30 p.m. Discussion on 'Polymer-Solvent Interaction.' Dr. E. E. Walker: 'Solvent Action of Organic Compounds for Polyacrylonitrile'; I. Williamson (Geigy Co., Ltd.): 'Plasticisers and their Action.'

The Chemical Society

Oxford: Physical Chemistry Laboratory, South Parks Road, 8.15 p.m. Alembic Club Lecture. Dr. D. A. Dowden: 'Industrial Catalysis.'

Royal Institute of Chemistry

London: Woolwich Polytechnic, S.E.18, 7.30 p.m. J. L. Hales: 'Applications of Infra-Red Spectroscopy.'

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 6 p.m. Second of three Cantor Lectures. Dr. P. W. Brian (I.C.I., Ltd.): 'Microbiology'

TUESDAY 25 NOVEMBER

The Chemical Society

Belfast: Queen's University, 7.45 p.m. Joint meeting with the RIC and SCI, and the Andrews Club. Dr. W. B. Whalley: 'Some Recent Advances in the Chemistry of Natural Products.'

Leeds: University, 6.30 p.m. Professor R. D. Haworth: 'Chemistry of the Tropolones.'

Manchester: College of Technology, Sackville Street, 6.30 p.m. Reading of original papers.

Society of Instrument Technology

Manchester: College of Technology, Sackville Street, 7.30 p.m. D. Burns: 'Thermal Controls for the Industrial Boiler.'

Society of Public Analysts

London: Burlington House, Piccadilly, W.1, 6 p.m. Eighth annual general meeting, Physical Methods Group. Dr. J. B. Firth: 'Applications of Some Physical Methods in Forensic Science, with Particular Reference to the Examination of Materials Relating to Criminal Investigation'; Dr. J. A. C. McClelland: 'Examination of Questioned Documents.'

WEDNESDAY 26 NOVEMBER

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Joint meeting of the London Section with the Food Group. The Earl of Halsbury (managing director, National Research Development Corporation): 'Science, Industry, and Society.'

Manchester Literary & Philosophical Society

Manchester: Portico Library, Mosley Street, 5.45 p.m. Chemical Section. Discussion on the SCI Messel Memorial Lecture of 1952.

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. J. W. Cuthbertson (Tin Research Institute): 'Uses of Tin in Industry.'

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 2.30 p.m. George F. Underhay (director, Bowaters Development & Research Ltd.): 'Raw Materials for Paper.'

Institution of Chemical Engineers

London: Visit to Kestner Evaporator Co., Ltd., New Cross, 2.30 p.m. Graduates' and Students' Section.

Society of Instrument Technology

London: 26 Portland Place, W.1, 7 p.m. Symposium on 'Control Valves.' A. R. Aikman: 'Some Theoretical Aspects'; H. R. Walton: 'Design'; B. W. Balls: 'Application.'

THURSDAY 27 NOVEMBER

The Chemical Society

Bristol: University, Woodland Road, 7 p.m. Joint meeting with the RIC and SCI. C. W. Todd: 'Phosphates and their Application to Industry.'

Liverpool: University, 5 p.m. Joint meeting with the RIC, SCI and BAC. R. P. Bell: 'Kinetics of Halogenation of Organic Compounds.'

Nottingham: University, 4.45 p.m. Professor H. J. Emeléus: 'Some Organometallic Compounds Containing Fluorocarbon Radicals.'

Sheffield: University, 7.30 p.m. Joint meeting with the RIC. Lecture by Professor F. A. Paneth.

Institute of Engineering Inspection

Manchester: Engineers' Club, Albert Square, 7.30 p.m. J. Parker: 'Measurement Standards.'

The Royal Institution

London: 21 Albemarle Street, W.1, 5.15 p.m. Second of four lectures. Dr. D. H. R. Barton (Reader in Organic Chemistry, Birkbeck College, University of London): 'The Chemistry of the Steroids.'

FRIDAY 28 NOVEMBER

Society of Chemical Industry

Cardiff: Connaught Rooms. South Wales Section, dinner-dance.

The Chemical Society

Dundee: University College, 7 p.m. RIC Lecture. Professor John Read: 'Alchemy and Art.'

Newcastle-upon-Tyne: King's College, 5 p.m. Dr. D. H. R. Barton: 'The Stereochemistry of *cyclo*Hexane Derivatives.'

Manchester Statistical Society

Manchester: Albert Hall, Peter Street, 6.45 p.m. Industrial Group. J. Anrep: 'Application of Statistical Methods to a Problem in Stock Control.'

Oil & Colour Chemists' Association

Manchester: Grand Hotel, 6.30 p.m. C. E. P. Box, M. E. Hobbs and F. North: 'Pigment Strength Testing with the Automatic Muller.'

Plastics Institute

Manchester: Engineers' Club, Albert Square, 6.45 p.m. B. J. Brown (Fothergill & Harvey, Ltd.): 'Development of Polyvinylidine Chloride Monofilaments for Textile Applications.'

Research & Development

Glaxo Chairman on Britain's Problems

HOW restraint on capital expenditure and shortage of materials hamper the speed with which the outcome of laboratory research can be developed and carried through to production is pointed out by the chairman, Sir Harry Jephcott, in his review accompanying the statement of accounts of Glaxo Laboratories, Ltd., Greenford, Middlesex, for the year ended 30 June, 1952.

A good deal of criticism had recently been expressed, says Sir Harry, about the delay which occurs in Britain between a discovery and its industrial application.

The British manufacturer, Sir Harry maintains, is not lacking either in his readiness to appreciate the ability of some new discovery nor in his desire to translate the new knowledge into products which will appeal to the potential user and so to expand his business at home and overseas.

He is, however, faced with considerable difficulties not of his own making. While the purely laboratory work associated with a new discovery would, in all probability, be completed with the facilities already at his disposal, development involved the creation of a pilot plant, and it was most unlikely that this would already exist.

It would thus be necessary to erect new buildings and to have a special plant designed and fabricated; capital expenditure must therefore be incurred. While Government imposed restraint on capital expenditures, this could not but involve time-consuming formalities. With the utmost understanding and good will on the part of Government officials delays were unavoidable before the necessary licences to erect buildings and to obtain steel were secured and when secured, they might be post-dated.

Knowledge of these delays undoubtedly affected all who might be concerned with the speedy development of a new invention and, by casting a shadow upon the rate of progress, could seriously reduce enthusiasm.

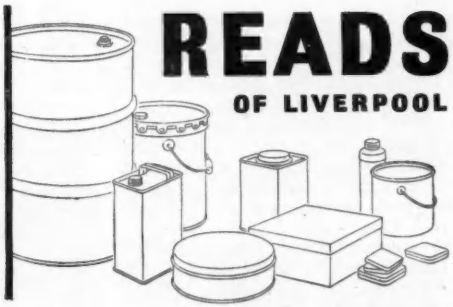
Moreover, if development was to take place with all the speed one could wish, it would probably be necessary to make a beginning upon considerable expenditure of a capital nature before the whole of the laboratory work had been completed and while the economics of the new process were still incompletely known. This would involve more than ordinary risk and the earlier development work was begun the greater the risk.

Must Take Risks

It was the function of the industrialist to take risks of this nature and to recoup losses on the failures by the profits upon the successful ventures. The knowledge that the Government would take 80 per cent of any increase in profits did not give that positive encouragement which was desirable to develop a new discovery with breakneck speed and unrestrained energy. Indeed, it might give those responsible reason to pause in doubt as to the wisdom of incurring what might be considerable expense.

Devising protection for a soft and delicate fruit can have been no easy problem, yet Nature found the perfect answer. The tough, resilient banana skin is proof against bird, blight and climate alike . . . it is, in fact, a perfect example of a well designed container.

We, too, have produced many equally satisfactory metal containers in the last 83 years. So many, in fact, that our standard range includes numerous types of ferrous and non-ferrous metal containers now in common use, and containers to new specifications are being devised regularly to meet special requirements. Whether the need is for a half-ounce tin or a fifty gallon drum... if the finish is to be plain, painted or lithographed . . . or if special internal treatment is called for—Reads of Liverpool will supply or can design a container to suit the product.



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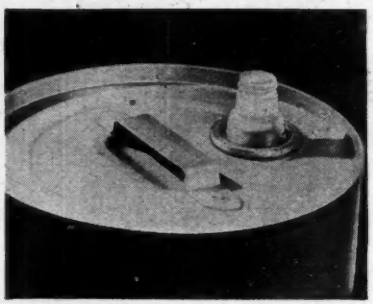
Publications & Announcements

A FLEXIBLE plastic closure suitable for drums and containers will be one of the main items shown by Visegrip Products, Ltd., of Liverpool, at the National Packaging Exhibition to be held at Olympia, London, in January, 1953. The FlexSpout, originally introduced in the U.S.A., is manufactured under licence by the company in Britain and is now in full production after delays due to the difficulties of obtaining adequate supplies of Polythene. The FlexSpout closure is a complete unit consisting of a metal ring and cover-plate within which is incorporated a flexible and retractable pourer spout, with diaphragm seal and



screw cap, all made of Polythene. It is leakproof, tamperproof, easy to use, and is unaffected by most chemicals and solvents. The unit is clenched into the container by a simple crimping tool after filling. To open the closure, the user prises off the metal cover plate, unscrews the Polythene cap, then after cutting out the scored portion of the neck, pulls the FlexSpout up to the extended position for easy pouring.

* * *

INTERCHANGEABILITY of three or four volute cases to each size of frame is one of the outstanding features of the Sigmund type A-N chemical pump. Design specifications and performance data are given in leaflet No. 6501 which may be obtained from the Sigmund Sales Office, Terminal House, Grosvenor Gardens, London, S.W.1. The pump is reported to be giving efficient service in plants for a number of well-known firms in the chemical and petroleum industries both at home and overseas.

CHEMICAL and electrochemical progress in Norway since the war is outlined in this year's edition of *Norway* published by the Norwegian Export Council. The volume, which is well laid out and illustrated, begins with the story of the growth of the Norsk Hydro, at present the largest individual exporter of nitrogen products in Europe. Other articles include the production of calcium carbide and abrasives; the Norwegian cement industry; chemicals from the forests; edible oil from the sea; seaweed as a source of chemicals; paint and varnish exports; the production of commercial explosives; developments in plastics; chlorate and sodium metal exports; and vitamins and pharmaceuticals from Norway.

* * *

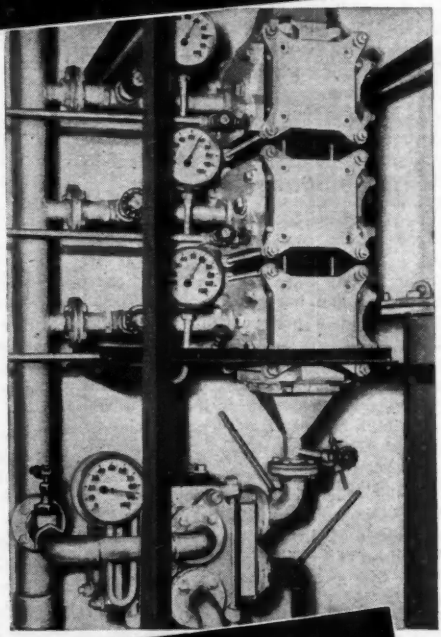
BEHAVIOUR of steel in the plastics range is a subject of comparatively recent study. Professor J. F. Baker in his work, first at Bristol University and later at Cambridge, saw in the Plastics Theory not only a means of determining the ultimate strength of beams and rigid frames, but also the possibility of evolving an entirely new and much more rational method of designing them. Trials, in collaboration with the British Constructional Steelwork Association, confirmed Professor Baker's conviction that rigid frames designed by the Plastic Theory would be considerably lighter than those designed by the orthodox elastic method. This method of design, set out in a form calculated to appeal to the structural designer, has now been published by the BCSA as technical brochure No. 5, entitled 'The Collapse Method of Design.' The report is by no means complete, but this brochure has been released as the first of a series to give some idea of the progress already made and to stimulate interest in further development.

* * *

A BOOK on biological staining methods has recently made its appearance from George T. Gurr, Ltd. The book is by George T. Gurr himself (price 5s. 6d. post free) and is in its 5th edition. First published in 1931, it covers a large field of staining methods, giving materials required, care of stains, refractive indices of materials, stain solubilities, and a formulary for over 150 stains, reagents, etc. The book should be as useful as its predecessors in earlier editions.

EVAPORATION PLANT

FOR SULPHURIC, HYDROCHLORIC & ACETIC ACIDS, ALKALIS, ETC.



The Powell Duffryn evaporator is a recent development based on "DELANIUM" GRAPHITE and can be operated as a climbing film or forced circulation unit. Special features include :—

1. Complete corrosion resistance to nearly all acids and alkalis.
2. Robust and capable of operating under high steam pressure and high vacuum.
3. Compact and of small height.
4. Special characteristics enable most acids to be evaporated at atmospheric pressure.
5. High evaporating performance. Overall coefficients of 500-700 B.Th.U./hr./°F/.sq. ft. obtainable for water evaporation.

This unit is specially recommended for recovery of spent acids, pickle liquors, etc.

Complete Evaporator plants of all sizes are available for early delivery.

We shall be pleased to arrange for our chemical engineers to call and discuss problems in detail.

Powell Duffryn Carbon Products Ltd.

CORROSION RESISTANT CHEMICAL PLANT IN CARBON & GRAPHITE

HAYES, MIDDLESEX. Telephone : Hayes 3994/8

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur

Increases of Capital

The following increases of capital have been announced: Monckton Coke & Chemical Co. Ltd., from £250,000 to £350,000.

Change of Address

Midland Silicones Ltd. have announced that as from 17 November their head office will be at 19 Upper Brook Street, London, W.1. Telephone: Grosvenor 4551, telegrams: Midsil Phone London.

Company News

British Xylonite Ltd.

Effects of the recession in the plastics industry began to be felt in Britain at the beginning of this year, and the virtual closing of the Australian market seriously affected three of the five major groups of British Xylonite, Ltd. An interim dividend of 2 per cent (less tax) on the £1,500,000 ordinary capital, as increased by a 150 per cent scrip bonus last November, has been declared. This compares with an interim of 5 per cent paid on the smaller capital in the previous year.

British Chemicals & Biologicals

Net group profit of British Chemicals & Biologicals to 30 June, after all charges, including tax, was £86,339 (£165,277). Turnover of the group was well maintained. Meeting at Felixstowe on 5 December.

Fisons Ltd.

Raw material price fluctuations and a reduction in purchases due to accumulation of stocks were the main causes in a fall from £1,901,633 to £1,602,958 in the group trading profit of Fisons, Ltd., for the year ended 30 June last. After full consideration of the future prospects, however, the directors recommend an increase of one per cent on the £4,438,556 ordinary capital. The final dividend is 7 per cent (6 per cent) making with the unchanged interim of 3 per cent, a total of 10 per cent (9 per cent). Meeting on 5 December at Felixstowe.

International Nickel Company of Canada

The interim report of the International Nickel Company of Canada, Ltd., and subsidiaries, for the nine months ended 30 September 1952, issued by Dr. John F. Thompson, chairman of the board of directors, shows net earnings in terms of U.S. currency of $45,683,360 after all charges, depreciation, depletion, taxes, etc., equivalent after preferred dividends, to $3.03 per share on the common stock. Net sales for the nine months were $228,915,593 compared with $203,253,035 for the corresponding period of 1951. During the last quarter of a century the company's output of nickel has risen from about 65,000,000 to approximately 250,000,000 lb. a year.

Market Reports

LONDON.—Business on the chemical markets has been steady during the past week with a fair amount of new inquiry both for the home using industries and for shipment.

Among the soda products there is a good routine inquiry for caustic soda, soda ash, chlorate of soda and for bichromate and hyposulphite of soda, while almost all the potash chemicals are finding a ready outlet. There is nothing outstanding to report among the miscellaneous chemicals.

As regards prices in the non-ferrous metal compounds group lead acetate is quoted at £147 10s. per ton, zinc dust at £139 10s. per ton and lead nitrate at £105 per ton. The quotations for red lead, white lead and litharge have fluctuated considerably and the latest prices are as follows: dry white lead £142 10s. per ton, dry red lead and litharge £126 15s. per ton. The makers announce a reduction of 15s. per cwt. in the price of tartaric acid.

Among the coal tar products pitch is in steady call with a fair export demand, while carbolic acid and creosote oil are in steady request on the home market.

MANCHESTER.—Values of heavy chemicals on the Manchester market during the past week have, with an odd exception, main-

tained a steady front. New business on home-trade account has been on a moderate scale, with a continued gradual improvement in the call for a wide range of textile chemicals. To some extent, fresh commitments show signs of being affected by the approaching year-end stock-taking operations. However, current contracts are being drawn against fairly well. Export movements of chemicals during the week have also been on a fair scale. There has been little change in conditions on the market for tar products. In most sections additional orders have been relatively slow, though in the aggregate there is a fair call against contracts.

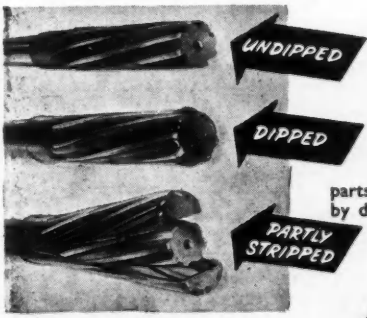
GLASGOW.—Business generally in the chemical trade was encouraging during the past week, with a tendency for buyers to consider negotiating contracts for 1953. There was no drastic change in the export market, and there was a steady flow of inquiries for overseas destinations.

Scottish Refinery Progress

The Grangemouth plant of the Anglo-Iranian Oil Co., visited by Queen Elizabeth, the Queen Mother, in September is expected to go on full stream this month. This will step up present output of motor spirit from 370,000 to 500,000 gallons. A plant is to be built shortly to manufacture sulphur from the extracted gases, with a capacity in the region of 20 tons a day. Capacity of the trans-Scotland pipeline is to be stepped up by the addition of booster pumps to maintain the Grangemouth project at full pressure.

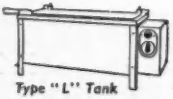
British Guiana Manganese

A preliminary examination of the manganese ore deposits in the North-West District has been carried out by a representative of the African Manganese Company Ltd. It is thought that the transportation of the ore would present considerable difficulty and the tonnage available would have to be large to justify the considerable expenditure necessary for transport.



PROTECTION
against CORROSION, RUST ETC.

"GLOSCOAT" is a plastic protective packaging material for the protection of tools, machine parts and simple assemblies, it is applied by dipping and removed by stripping.


Type "L" Tank

It protects against corrosion, rust and rough handling, and can reduce packaging time by at least 60 per cent man-hours.

Manufactured by Glostics, Ltd., Gloucester, England

GLOSCOAT

STRIPPABLE HOT DIP PROTECTIVE COATING

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45 NEWHALL ST., BIRMINGHAM 3 (Tel. Central 6342-3)

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order,* 1952.

COUNTY COUNCIL OF THE COUNTY OF LANARK
EDUCATION COMMITTEE
THE TECHNICAL COLLEGE, COATBRIDGE

APPLICATIONS are invited from suitably qualified and experienced men for the post of **LECTURER IN CHEMISTRY** at the Technical College, Coatbridge.

This post necessitates the teaching of Chemistry up to and including the Higher National Certificate level and a qualification to teach Physical Chemistry to the A.2 level is desirable.

The basic salary payable will be as follows :—

(1) If a certified teacher—in accordance with the Teachers' Salaries (Scotland) Regulations, 1951 ;
(2) If an uncertified teacher—on scale with maxima ranging from £595 to £915, depending upon qualifications.

Placing will be granted for approved industrial service.

An additional payment will be made in respect of day hours of timetable duties in excess of 30 per week, and in respect of day timetable duties after the completion of 41 weeks in any session.

Canvassing of members, directly or indirectly, will be a disqualification.

Applications, with testimonials, to be lodged, not later than two weeks after the appearance of this advertisement with the undersigned, from whom forms of application may be obtained.

JOHN S. McEWAN,
DIRECTOR OF EDUCATION AND DEPUTE COUNTY CLERK,
LANARKSHIRE HOUSE,
191, INGRAM STREET,
GLASGOW, C.1.

ASSISTANT ENGINEER required by Chemical Engineering Firm in London. Qualifications required are : Age up to 30 ; B.Sc., or equivalent ; good knowledge of physics and heat transfer essential ; good mathematics ; understanding of chemistry desirable ; practical Works' experience essential ; understanding of general Office procedure and technical sales an advantage. The position offers excellent opportunities to a man having these qualifications coupled with a keen business outlook. Write stating age, qualifications, salary required to **BOX NO. C.A. 3181.** THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

FOR SALE

CHARCOAL, ANIMAL AND VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal-insulating ; also lumps ground and granulated ; established 1830 ; contractors to H.M. Government.—**THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS : "HILL-JONES, BOCHURCH LONDON," TELEPHONE 3285 EAST.**

DELAFILA, THE INERT FILLER. Used in the manufacture of Fertilisers, Insecticides, Paints, Plastics and Insulating and Sealing Compounds. Prompt supplies in a wide range of fineness grades. **THE DELABOLE SLATE CO., LTD. DELABOLE, CORNWALL.**

GRAVITY Roller Conveyor several lengths, Rolls. 2½ in. diam. by 16 in. 3 in. centres. Good condition. **THOMPSON & SON (MILLWALL), LIMITED, CUBA STREET MILLWALL E.14.** (Tel. : East 1844.)

FOR SALE

600

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CREAM MIXING UNIT by Pfaudler, comprising 2 S.J. Glass-lined Vessels, each 1 ft. 1 in. diam. by 3 ft. deep, with bottom outlets discharging to S.J. Glass-lined Mixer 30 in. diam. by 36 in. deep, Stainless Steel Agitator, motorised A.C., through gearbox. Unit mounted in steel staging with access ladder. Complete with all valves, piping, etc.

4—**SIFTER MIXERS** by Young. M.S. Mixing Trough, 64 in. by 21 in. by 22 in. deep. Blending chamber feeds material to positive action brush sifter. F. and L. pulley drive.

Vertical **COPPER STILL,** 6 ft. diam. by 6 ft. deep, on straight with domed top and concave bottom. 18 in. bolted cover on top. Bolted manhole cover in centre of side. Fitted L.P. 2½ in. diam. steam coil, 4 ft. p.c.d., 7 turns. Fractionating column, 15 ft. by 1 ft. 9 in. diam. of copper construction and contains 30 trays.

Pfaudler 150-gal. Vertical **GLASS-LINED STILL.** Steam jacket, 30 lb. pressure. Bolted cover has 6 in. by 7 ft. 6 in. high, 3-section glass-lined column with 2 in. diam. take-off pipe.

GEORGE COHEN SONS & CO., LTD.,
WOOD LANE, LONDON, W.12,
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STANNINGLEY, NR. LEEDS.
Tel. : Pudsey 2241.

SCREENLESS PULVERIZERS for fine grinding of Chemicals. Also **CYCLONES, ROTARY VALVE FEEDERS. Callow (Engrs.) Ltd. Kirkby Trading Est., Liverpool.**

STAINLESS Steel F.D.P. quality ¼ in. thick plate welded construction horizontal cylindrical enclosed **STORAGE TANK,** 2,000 gallons capacity, 6 by 12 ft. long ; manhole inlet and outlet connections. Further details, **BOX No. C.A. 3182, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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"TORRANCE" TRIPLE-ROLL REFINER, three steel rollers 12 in. wide by 6 in. diam., geared, complete.
"Roberts" Dual-head VACUUM FILLING MACHINES for liquids, stainless steel contact parts.
DUST EXTRACTOR OR AIR BLOWER FANS, motorised, 250 c.f.m. for individual machines.
AIR BLOWING FAN, large capacity, 36 in. impellor, 14 in. square delivery, ducting.

WELDING'S, SAXONE BUILDINGS, TARLETON STREET, LIVERPOOL, 1.

30 CWT. CHAIN BLOCKS, 10 ft.-12 ft. lift, ex-Government surplus. £15 per set.
5 CAST-IRON JACKETED PANS, 36 in. diam. by 27 in. deep, 1½ in. bottom outlet. £20 each.
1 MILD STEEL WELDED OPEN-TOP TANK, 60 in. by 27 in. by 42 in. by ⅜ in. plate. £25.

THOMPSON & SON (MILLWALL), LTD.,
CUBA STREET, MILLWALL, E.14.
TEL. EAST 1844.

FOR SALE

3 JACKETED **INCORPORATORS,** double "Z" arms, double geared, power-driven tipping motion, with counterbalancing weights.

1—Baker Perkins **MIXER** as above, not steam jacketed, single geared, complete with 25 h.p. A.C. motor.

3—Baker Perkins and Werner Jacketed **MIXERS** screw tipping pattern, friction pulley drive, single geared, with double-fin type agitators.

4—Gardner **RAPID SIFTER MIXERS** and **MIXERS** only, various sizes, one with brass fitted interior and glass-lined end plates.

27—Various **POWDER DRESSING** or **SIFTING MACHINES,** totally enclosed, with barrels from 80 in. long by 22 in. diam. to 120 in. long by 30 in. diam., belt driven, with collecting worm in hopper bottoms.

1—Simon Horizontal Tubular **DRIER,** 12 ft. long, 100 lb. steam pressure, size 3B, requiring 12 b.h.p.

4—Recessed Plate **FILTER PRESSES,** 30 in. square, 70 plates in each, centre fed.

5—Johnson **FILTER PRESSES,** 24 in. square, side feed and enclosed delivery, fitted 29 plates and 30 frames.

1—Johnson **FILTER PRESS,** 36 in. square, plate and frame type, double inlet and enclosed delivery ports.

Johnson Oil **FILTER PRESS,** Premier type; plates 2 ft. 8 in. by 2 ft. 8 in., of which there are 45, with angle lever closing gear.

Johnson Experimental **PRESS,** fitted 11 plates, 19 in. square, with feed pump, reduction gearbox and electric motor.

Steam-heated **FILTER PRESS,** Premier type, 32 in. square, with 30 recessed plates.

Wood **FILTER PRESS,** fitted 69 ribbed plates, 2 ft. 8 in. square, with top centre feed and bottom enclosed delivery channel.

48 in. Hydro **EXTRACTOR,** self-balancing, swan-neck type, self-emptying bottom.

2—30 in. Swan-neck **HYDROS.**

1—26 in. Swan-neck **HYDRO.**

Heavy Cake **CRUSHING MILL,** 2-pair high, by Nicholson, for cake up to 3 in. thick, rolls 30 in. long, top with coarse teeth 9 in. diam., bottom with finer teeth 12 in. diam.

5 Sets A.A. **CRUSHING ROLLS** for linseed, cotton seed, etc., 48 in. long, belt driven, with feed hopper, side frames, baseplate and striking gear.

Bennett Copper-built **EVAPORATOR,** 4 ft. diam. by 4 ft. 6 in. high, steam-jacketed bottom, mounted on legs, with swan-neck vapour pipe and separate vertical belt-driven vacuum pump.

Douglas **ROTARY PUMP** for oil, soap, etc., belt driven.

6 Various Horizontal Duplex **STEAM PUMPS,** Worthington and Tangye pattern, 1 in. to 2½ in. suction and delivery.

"U"-shaped Horizontal **MIXER,** 8 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven, end outlet, square horizontal centre shaft with cast radial type mixing arms, last used for lineoleum paste.

1—"U"-shaped **MIXER,** as above, but 7 ft. long.

4—5-roll **REFINERS,** fitted chilled iron, water-cooled rolls, 40 in. long, 16 in. diam., belt and gear driven, with clutch drive suitable for motor, by Baker Perkins, Ltd.

No. 2HS Hammamac **HAMMER MILL,** No. 1 size, Standard Miracle Mill, No. 2 size Standard Miracle Mill and a No. 3 Super Miracle Mill, with fans, piping and cyclones.

7 ft. Torrance Positive-driven **EDGE RUNNER,** 2 Vertical Paint Pug Mills, 2-bar Disc Paint Grinding Mills, and 2 Horizontal 40-gallon capacity Cox Pug Mills for paint.

RICHARD SIZER, LTD.
ENGINEERS,
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Telephone 31743

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MORTON, SON & WARD LIMITED,
offer
HYDRO EXTRACTORS

By **BROADBENT,** all electric, underdriven:

ONE 48 in. pitless, 3-point suspension, steel galvanised basket, lift-out type.

ONE 48 in. pit type, 3-point suspension, steel galvanised basket.

ONE 48 in. pit type, 4-point suspension, stainless steel imperforate basket, complete with skimming attachment, A.C. or D.C.

ONE 60 in. pit type, 3-point suspension, steel galvanised basket.

ONE 72 in. pit and **ONE** 72 in. pitless type, 3-point suspension, steel galvanised baskets.

By **WATSON LAIDLAW:**

TWO 42 in., 3-point suspension, underdriven through Vee ropes from flange-mounted vertical spindle motor.

By **MANLOVE ALLIOTT:**

ONE 21 in., imperforate conical basket, 21 in. tapering to 12 in. at bottom. Underdriven through flat belt fron flange-mounted vertical spindle, 2 h.p. motor.

By **BROADBENT** (steam driven):

ONE 48 in., 3-point suspension, lead lined throughout and ebonite-lined basket.

ALL ELECTRIC HYDROS ARE SUITABLE FOR 400/3/50 SUPPLY AND ARE COMPLETE WITH STARTING EQUIPMENT

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NEW and available for immediate delivery:

100 gallon welded construction, mounted on three legs and certified for 100 lb. p.s.i. w.p.

150 and 200 gallon, all welded, mounted on three legs and certified for 80 lb. p.s.i. w.p.

SECOND-HAND:

ONE 600 gallon totally enclosed **JACKETED AUTOCLAVE** with detachable top cover, of riveted construction, suitable for 180 lb. p.s.i. w.p. in jacket and 100 lb. w.p. internally.

ANY OF THE ABOVE CAN BE ARRANGED WITH MIXING GEAR, MOTORISED, OR FAST AND LOOSE PULLEY

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"MORWARD" "U"-shaped Trough POWDER MIXERS in sizes 8 to 100 cu. ft., arranged with scroll-type mixing gear.

ONE 3 cwt. capacity **GARDNER TROUGH MIXER,** stainless steel lined trough and twin chrome-plated scroll blades mounted on stainless steel shaft. Fast and loose pulley drive.

Horizontal Churn-type **MIXING VESSELS** and Vertical Mixing Vessels, totally enclosed and open top in various sizes.

All types of **MIXING VESSELS** constructed to meet requirements.

ONE CHRISTY & NORRIS DISINTEGRATOR, size 00, arranged with worm and funnel feed.

CENTRIFUGES

ONE ALFA LAVAL, 150 g.p.h., with built-in geared pump, motorised.

ONE ALFA LAVAL, 150 g.p.h. laboratory type machine, motorised.

ONE SHARPLES Centrifuge, as new, motorised.

All suitable for 400/3/50 supply.

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DOBCROSS, NR. OLDHAM,
LANCS.
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12,000 gallon Welded Cylindrical Enclosed **TANKS**, 30 ft. by 9 ft.
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1,000 gallon Welded Petrol **TANKS** (two).
3,000 gallon "**BRAITHWAITE**" **SECTIONAL**, 12 ft. by 10 ft. by 4 ft.
1,250 gallon Welded 2-compartment **VEHICLE TANK.**
BOILERS, PUMPS, STILLS, CONDENSERS, HYDROS, AUTOCLAVES, MIXERS, PANS, CONVEYORS, OVENS, DRYERS, ETC.

Send for lists.

HARRY H. GARDAM & CO., LTD.
STAINES.

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4,000 gallon Cylindrical, 35 ft. by 5 ft. Riveted, enclosed.
3,400 gallon, 8 ft. 3 in. by 8 ft. 3 in. by 8 ft. Riveted, open top.
3,000 gallon **NEW** Underground Petrol Tank, 13 ft. 6 in. by 7 ft. diam.
1,900 gallon Rectangular, 11 ft. by 8 ft. by 3 ft. 6 in. deep. Welded, enclosed.
1,550 gallon Rectangular, 11 ft. by 7 ft. 6 in. by 3 ft. deep. Welded, enclosed.
3—1,550 gallon, 7 ft. by 5 ft. by 5 ft. Welded, enclosed.
1,000 gallon, 8 ft. by 5 ft. by 4 ft. Riveted, enclosed.
750 gallon Cast-iron Sectional, 10 ft. 6 in. by 3 ft. 10 in. by 3 ft. deep. Open top.
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Various Enclosed and Open-top Galvanised Tanks.

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GRINDING of every description of chemical and other materials for the trade with improved mills. **THOS. HILL-JONES, LTD., "INVICTA" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH, LONDON" TELEPHONE: 3285 EAST.**

WET AND DRY GRINDING Micronising, Grading and Mixing of Minerals and Chemicals for all trades. Also suppliers of ground zircon, sillimanite, fused silica, precision casting materials and a wide range of ground minerals.

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THE Proprietor of **BRITISH PATENT No. 579,330,** entitled "**PROCESS FOR CRYSTALLISING SALTS,**" offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to **SINGER, STERN & CARLBERG, 14 EAST JACKSON BOULEVARD, CHICAGO 4, ILLINOIS, U.S.A.**

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SPENCER CHAPMAN & MESSEL, LTD.

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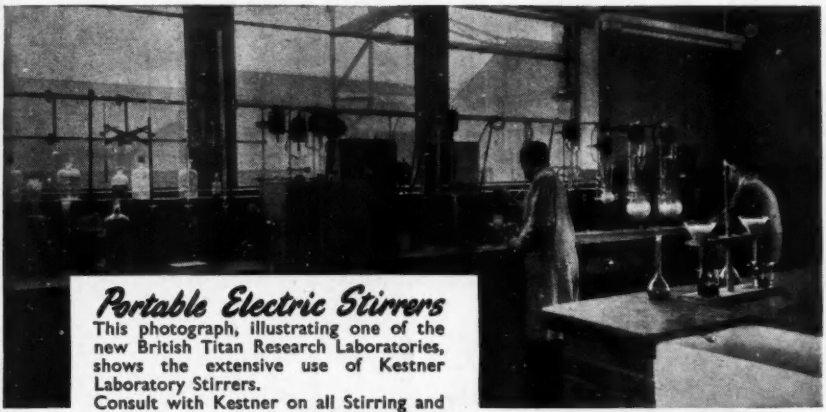

Portable Electric Stirrers

This photograph, illustrating one of the new British Titan Research Laboratories, shows the extensive use of Kestner Laboratory Stirrers.

Consult with Kestner on all Stirring and Mixing Problems, whether they arise in the Laboratory or on the Plant.

Have you a copy of our new brochure No. 287 describing the full range of Kestner Stirrers and Mixers ?

by Kestner THE CHEMICAL ENGINEERS

KESTNER EVAPORATOR & ENGINEERING CO., LTD., 5, GROSVENOR GARDENS, LONDON, S.W.1.

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ESTABLISHED 1867
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SPECIALISTS IN
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Decolorising **CARBON**
ALL GRADES FOR ALL TRADES
HIGHEST EFFICIENCY
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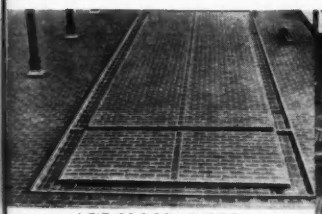
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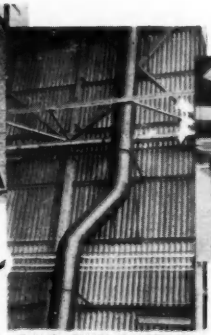
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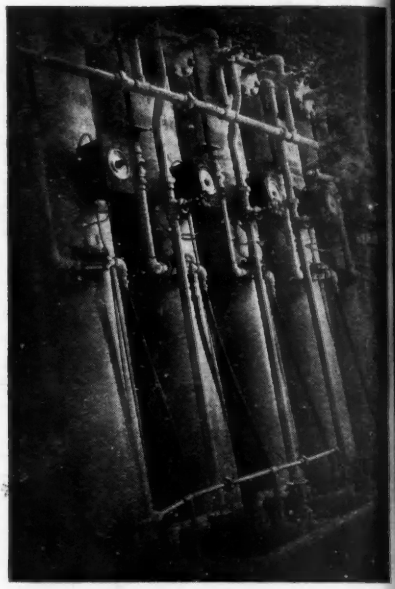

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